DUE DATE SLIP

GOVT. COLLEGE, LIBRARY

KOTA (Raj.)

Students can retain library books only for two weeks at the most.

BORROWER'S No.	DUE DTATE	SIGNATURE

COMPTON'S
PICTURED ENCYCLOPEDIA AND FACT-INDEX

Interesting · Accurate · Up-to-date

TO INSPIRE AMBITION
TO STIMULATE THE IMAGINATION, TO PROVIDE THE
INQUIRING MIND WITH ACCURATE
INFORMATION TOLD IN AN INTERESTING
STYLE, AND THUS LEAD INTO
BROADER FIELDS OF KNOWLEDGE,
SUCH IS THE PURPOSE OF
THIS WORK



VERNMENT COLLEGE
LIBRARY
UTAH.

Volume 6

1956 Edition

PUBLISHED BY
F. E. COMPTON & COMPANY + CHICAGO

1956 EDITION

COMPTON'S PICTURED ENCYCLOPEDIA

COPYRIGHT 1922, 1923, 1924, 1925,
1926, 1927, 1928, 1929, 1930, 1931,
1932, 1933, 1934, 1935, 1936, 1937,
1938, 1939, 1940, 1941, 1942, 1943,
1944, 1945, 1946, 1947, 1948, 1949,
1950, 1951, 1952, 1953 1954, 1955
BY F E COMPTON & COMPANY

Imperial and International Copyright secured All rights reserved for all countries Translation into foreign languages, including the Scandinavian, specifically reserved Printed in U S A.

LIBRARY OF CONGRESS CATALOG CARD NUMBER 55-9384

Here and There in This Volume

AT ODD TIMES when you are just looking for "something interesting to read," without any special plan in mind, this list will help you With this as a guide, you may visit faraway countries, watch people at their work and play, meet famous persons of ancient and modern times review history s most brilliant incidents, explore the marvels of nature and science, play games—in short, find whatever suits your fancy of the moment This list is not intended to serve as a table of contents an index, or a study guide For these purposes consult the Fact Index and the Reference Outlines

Pictures You Will Enjoy

SIR GALAHAD THE PERFECT KNIGHT 2
GEOLOGY S TIME SCALE FOR EARTH HISTORY 58
GLASS MODELS OF SEA LIFE 124
BIOGRAPHY OF A HICKORY NUT 354
THESE HORSES DEMONSTRATE THE FIVE GAITS 428*f*

For the Reading Hour

THE DEATH OF HECTOR 328
SOME ADVENTURES OF THE GREAT HERCULES 342
MAN S FRIEND AND SERVANT THE HORSE 428

Parent and Child, School and Home

THE ART AND SCIENCE OF GARDENING 12
TOOLS OF OUR EVERYDAY SPEECH 147
HOW TO MAKE AND READ GRAPHS AND CHARTS 157
YOUR HEALTH AND HOW TO KEEP IT 300
THE CHOICE OF A HOBBY 387

High Lights in History's Pageant

GETTYSBURG—THE TURNING POINT OF THE CIVIL WAR 105
THE LAND WHERE EUROPEAN CIVILIZATION WAS BORN 188
HISTORY S PAGEANT THROUGH THE AGES 359
THE DAYS OF CRECY, POITIERS AND AGINCOURT 415

The Story of the Presidents

AMERICA'S SECOND MARTYRED PRESIDENT 20
THE HERO OF APPOMATTOX IN WAR AND IN PEACE 152
HARDING—IN THE WHITE HOUSE AFTER THE FIRST WORLD WAR 266
PRESIDENT AND GRANDSON OF A PRESIDENT 273
THE INDIAN FIGHTER WHO BECAME PRESIDENT 277
PRESIDENT HAYES VALIANT FIGHTER IN WAR AND PEACE 296
HOOVER—THE 31ST PRESIDENT OF THE UNITED STATES 419

HERE AND THERE IN THIS VOLUME

Some Famous Men and Women

GALILEO, FOUNDER OF MODERN PHYSICS 5
GANDHI, APOSTLE OF HOME RULE FOR INDIA 8f
THE MAN WHO VANQUISHED THE DEADLY MOSQUITO 142
THE GREAT-HEARTED HERO OF LABRADOR 215
GUSTAVUS ADOLPHUS, WHO WON A WAR AT TWENTY 233
HOW HANNIBAL MADE ROMAN POWER REEL 259

Travel Views at Home and Abroad

THE "EMPIRE STATE OF THE SOUTH" 69
THE GERMAN PEOPLE AND THEIR LAND 87
THE LONGEST, DEEPEST CANYON IN THE WORLD 149
THE FIVE GREAT LAKES OF NORTH AMERICA 178

The World at Work and at Play

THE INVISIBLE FUEL THAT COOKS OUR MEALS 30
SCOUTING WITH GIRLS OF MANY LANDS 113
GLASS FOR PRACTICAL AND DECORATIVE USES 119
GOLF—A GAME EVERYONE CAN PLAY 136
HOCKEY ON LAND AND ON ICE 402

Guideposts to Literature, Art, and Music

THE LANGUAGE OF LUTHER, GOETHE, AND SCHILLER 82
THE MASTER MIND THAT GAVE US 'FAUST' 129
THE ART AND LITERATURE OF CLASSIC GREECE 203, 208
THE BROTHERS GRIMM, COLLECTORS OF FOLK TALES 216
THE AUTHOR OF 'THE SCARLET LETTER' 294
THE BLIND FATHER OF ALL THE POETS 415
HUGO, MASTER OF POETRY AND ROMANCE 440

Exploring a World of Facts

GEOGRAPHY—STUDYING THE EARTH AS MAN'S HOME 39
HOW GEOLOGY READS EARTH HISTORY IN ROCKS 49
GOLD—THE AGE-OLD MEASURE OF WEALTH 131
GRAVITATION—THE FORCE THAT BINDS THE UNIVERSE 170
HEAT—WHAT IT IS AND HOW IT BEHAVES 315

The Wonder We Call Life

LONG-DISTANCE FLYING CHAMPIONS OF THE WORLD 230
THE HEART—A LIVING PUMP FOR BLOOD 311
HOW HEREDITY WORKS TO PASS ON TRAITS 343
HIBERNATING TO LIVE THROUGH WINTER COLD 352

Interest-Questions Answered in This Volume

How does a grasshopper sing? 168
What animal is noted for its wild laughter? 460
Why did Leif Ericson call America Vinland? 155
What animal is said to sweat blood? 357
How does true hibernation differ from sleep? 352
What insects sometimes travel in such clouds that they darken the sky? 168*a*
What worm is one of man's greatest enemies? 419
Why do grouse grow feathers on their feet in winter? 220
Why does the giraffe have such long legs and neck? 111
Why does a man's hat have a little bow on the inside? 282
How does grass check erosion? 167
What is "heavy" water? 459
What Greek statue inspired Nathaniel Hawthorne's *Marble Faun*? 205
Does the human heart ever rest? 31
Where did handball originate? 256
Who was the "man without a country"? 247
How does the heat of the sun affect nature? 316
How can gas be made to burn under water with a flame so hot that it cuts through steel? 28 picture
Which can run faster—a man or a hippopotamus? 357
What member of the grass family grows 100 feet tall? 166
What animal has a hide an inch and a half thick? 357
How can water run uphill? 457 picture
If a boy were as good a jumper as the grasshopper how high could he leap? 168
What birds have had a monument erected to them? 230
How is friction used to start a fire? 3 6
What kind of compass is independent of the earth's magnetism? 238
Why was Prince Henry of Portugal called "the Navigator"? 340
How big does a halibut grow? 248
In what legislative assembly do members wear hats? 282
Where did the wild mustangs that used to roam the Western plains come from? 428*d*
Why are some hailstones larger than others? 242
What gas was discovered on the sun before it was found on the earth? 331
How large is the human heart? 311
How were the grapevines of France threatened and saved by American vines? 55–6
What common herb grows its male and female flowers on separate plants? 333
Why were the Romans not as great artists as the Greeks? 207
What are some economic uses of animal hair? 243
Who created the Uncle Remus stories? 271
What great German writer served many years as a minister of state? 130
What American poet was also a prominent physician? 408
What is meant by a Fabian policy? 259–260
What poem saved a ship from destruction? 408
What witty author once a student of medicine died after trying to cure himself of a fever? 135
What classics are supposed to have been created by a blind wandering minstrel? 415
There are nine basic rules of safe gun handling. Name some of them. 451
Why can felt be made from animal hairs but not from fibers like silk or linen? 243 picture
What flower sprang from the blood of a beautiful youth? 454
What little newspaper helped to free the slaves? 27
What famous early explorer was cast adrift by his men to perish in the Arctic? 437
What is the name of the spring festival held yearly in the Harz Mountains? 280
In what lake is it impossible for the human body to sink? Why? 185
What makes a geyser spout? 106
Why do spinning tops stay erect? 237
How did the gopher get his name? 140
What islands have been called "World's End"? 3
How does a tightrope walker keep from falling? 173
Who are the gypsies? 235
What was the Brook Farm experiment? 294
What is the origin of our celebration of Hallowe'en? 250
What is meant by home economics? 409
Where is the greatest gold producing region in the world? 132
Which bird travels the farthest? 230
Why is helium the best gas for inflating balloons? 331
Where is the world's oldest golf course? 138
Where is the highest mountain peak in the world? 355
Who first studied the heavens through a telescope? 5
How are electric light bulbs "frosted"? 122*b*
What is gypsum? How long has it been used? 236
What is meant by a writ of "habeas corpus"? 239
Who served two states as governor and was twice president of the Republic of Texas? 434
Are pigs naturally dirty animals? 402
What were the labors of Hercules? 342
Why do the Chinese call the Yellow River the "Sorrow of China"? 454
What gland makes dwarfs or giants? 425
Name the three great Greek writers of tragedies 210
In what great French novel was a convict the hero? 442
How fast does a man travel when falling through the air from an airplane? 172
What famous French author was known as the "exile of Guernsey"? 441
What Greek god had wings on his shoes? 348

KEY TO PRONUNCIATION

Pronunciations have been indicated in the body of this work only for words which present special difficulties. For the pronunciation of other words, consult the Fact-Index Marked letters are sounded as in the following words *cāpe, ăt, fār, fâst, what, fạll; mē, yĕt, fēr̀n, thêre;* īce, bĭt; rōw, wȯn, fôr, nŏt, do; cūre, bŭt, rude, fụll, bûrn; *out*; *ü*=French *u*, German *ü*; *ġem*, *ḡo*, *thin*, *then*; *ṅ*=French nasal (Jeaṅ); *zh*=French *j* (*z* in azure); *κ*=German guttural *ch*.

GAINSBOROUGH THOMAS (1727–1788) As a small boy Thomas Gainsborough sketched every tree gate stump and stile within miles of his house and throughout his career his chief love was landscape painting Yet he won his great popularity as a painter of portraits

Gainsborough was born at Sudbury in Suffolk County England When he was 14 his parents sent him to London as assistant to Hubert Gravelot an illustrator and engraver and two years later he entered St Martin s Lane Academy where he studied under Francis Hayman a skillful painter of portraits and historic scenes He married at 19 and for 14 years lived quietly at Sudbury and Ipswich painting and studying music and nature. Then he moved to gay and fashionable Bath and found it necessary to increase his means Since he could not sell his landscapes he began to concentrate on portrait painting and had immediate success Some years later he moved to London and became a favorite painter of the royal family He was one of the original members of the Royal Academy (founded 1768) but withdrew in 1784 because of disagreements over the hanging of his paintings

Gainsborough was the first of the great English landscape painters He refused to copy foreign schools of painting but put down what he himself saw in nature His landscapes are feathery and poetic but have correct draftsmanship He also ranks as one of the great English portrait painters His portraits furnish a valuable record of the elegance and graciousness of 18th century England

A FAMOUS PORTRAIT BY GAINSBOROUGH



Gainsborough painted The Honourable Mrs Graham with delicacy charm and dignity These were the qualities that gave his studies of the fashionable and beautiful women of 18th century England a distinction as well as popularity

Among Gainsborough s famous landscapes are Cornard Wood The Market Cart The Watering Place and The Bridge His portraits include The Honourable Mrs Graham David Garrick Mrs Siddons Mrs Robinson (Perdita) The Duchess of Devonshire His famous Blue Boy hangs in the Huntington Art Gallery at San Marino Calif

GALAHAD Seated at dinner one day the Knights of the Round Table were talking of the Holy Grail the cup out of which Christ drank at the Last Supper Suddenly according to Arthurian legends the torches in the great hall went out Across the darkness streamed a band of silver light Against that faintly as through a mist they saw a flush of rose Only Sir Galahad saw the cup clearly— all crimson and glowing like a ruby and heard a voice which said Galahad follow me

The son of Sir Lancelot and the fair Elaine of Astolat Galahad was the noblest of all knights and his faith and purity gave him powers denied to others The sacred vessel according to the story had been brought to Britain by Joseph of Arimathea but when the land fell into wickedness it was hidden away and the search for it became the noble quest of the knights of King Arthur s Round Table All the knights swore a vow to live a holy life for a year and a day while they searched for the Holy Grail Only four returned Sir Bors and Sir Lancelot had seen the Grail in visions Sir Perceval had seen it because he was Galahad s friend and next to him the purest in heart After long wandering he found Galahad in prayer in a hermit s cell clad in silver armor and with a face like an angel s



Painting by George Frederick Watts

SIR GALAHAD, THE PERFECT KNIGHT

Oh my friend ' cried Galahad the Holy Grail shines always before blood red and glowing like a star guiding me to Heaven It gives me victory over every sin and shame and wrong in the world Come with me

They went out into a storm and over a hilltop Galahad ran eagerly before acro s a bridge which spanned a black marsh to the sea and disappeared into the night As Perceval knelt weeping and praying, there again came the shaft of silver light and on it the glowing Grail In the morning he found Galahad s body beautiful thin and worn as a saint s and buried it by the sea.

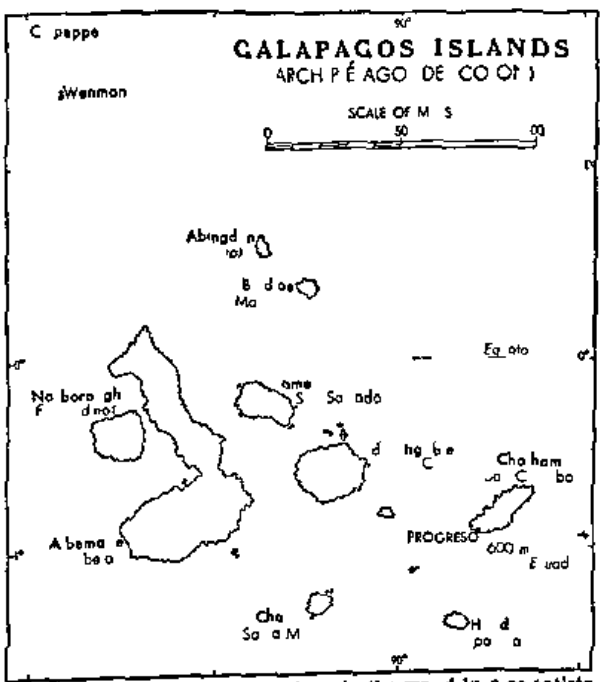
Because of pious zeal repentance of sins and goodness said King Arthur three of you have had a vision of the Grail But only Galahad really found the sacred cup

The story of Sir Galahad is treated in Malory s Morte d Arthur and in other medieval romances It is also the theme of Tennyson s Sir Galahad and The Holy Grail in his Idylls of the King (*See* Arthur King Round Table)

GALÁPAGOS (*ga lä pa gōs*) **ISLANDS** Some 600 miles off the coast of Ecuador the Galápagos Islands lift their gaunt lava ridges and peaks out of the Pacific Ocean Nine islands and about fifty islets and reefs are scattered over an area about 200 miles in diameter directly astride the *Equator But the tropical* heat is moderated by the moist southeast trade winds and by the cool Humboldt or Peruvian Current whose northern limit is in this vicinity

Many of the islands have both English and Spanish names The largest is Albemarle (Isabela) about 75 miles long Here at the southern end a volcanic cone rises nearly 5 000 feet the highest point in the group The other chief islands in order of size are Indefatigable (Santa Cruz) Narborough (Fernandina) Chatham (San Cristóbal) James (San Salvador) Charles (Santa María) Bindloe (Marchena) Hood (Española) and Abingdon (Pinta) About a hundred miles northwest of the main group are the islets of Wenman and Culpepper

The Galápagos are so desolate that they have been called World s End From the shore the land rises in a series of volcanic craters *Perhaps as many as* 2 000 cones dot the islands The windward coasts drenched by mists, are tangles of mangrove swamps



Strange forms of life like no other s in the world lure scientists to these wonderful *desolate islands once a pirates lair* Chatham with fresh water supply s the chief of these islands which command the western *approach to* the Panama Canal.

On the dry leeward coast at the north and west of each island gray lava cliffs rear stark out of the sea or thin beaches of white sand recede to desert growth of cactus thorn trees and barbed grass The uplands often swathed in clouds are matted with growth chiefly bursera thorn thistle and acacia Here rain falls in the winter filling rocky pools but flowing springs are rare Flies plague the explorer by day and mosquitoes by night The harsh lava cinders cut shoes to ribbons

Peculiar Animals on the Islands

The islands are remarkable for their animals When Charles Darwin the first of several scientists to visit the Galápagos came here in 1835 he found that half the birds and plants were different from species in other parts of the world About a third of the shore fish and nearly all the reptiles also differed These variations helped to suggest to Darwin the theory of evolution set forth in his Origin of Species, (*see* Darwin Charles)

As man has made few attempts to settle the Galápagos the animals show little fear Giant land iguanas three feet or more in length bask under cactus like prehistoric dragons Sea iguanas swarm the coastal rocks which are frequented also by herds of sea lions and southern seals Among the birds peculiar to the islands are species of pelican penguin flightless cormorant heron dove finch mockingbird, hawk and albatross

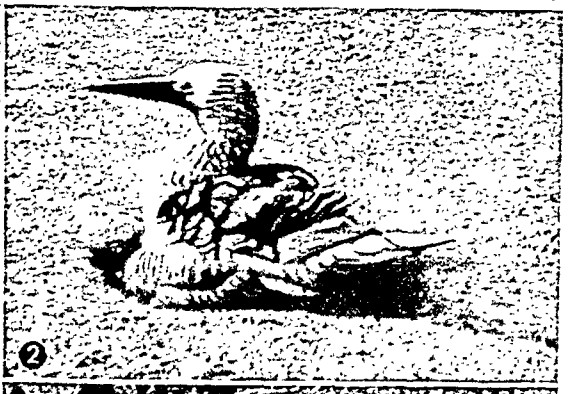
An occasional giant tortoise recalls the days when these monsters were so abundant that Spanish explorers named the islands for them from the Spanish word *galápago* tortoise Some weighed 200 pounds or more and were strong enough to carry a man In the days of sailing ships they were a source of fresh meat Sailors caught them by the hundred and dumped them into the hold where the *tortoises* lived without food or water until needed Early in the 20th century Ecuadorans slaughtered enormous numbers for oil On some of the larger islands roam wild dogs cats goats burros and even some cattle—descendants of animals left here by passing vessels

Haunts of Pirates and Sea Rovers

The Galápagos were discovered in 1535 by the Spanish bishop of Panama but no attempt was made to settle them Late in the 17th century the islands became hideouts for buccaneers and sea rovers,

BIRDS AND REPTILES OF THE BLEAK GALAPAGOS ISLANDS







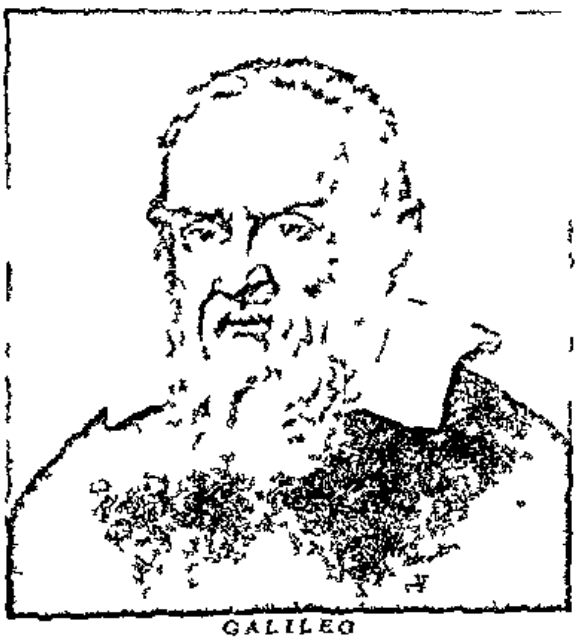




1. A marine iguana suns itself on jagged, black volcanic rock. 2. Boobies nest in the crater of a volcano. 3. Frigate, or man-o'-war, birds are abundant. Notice the inflated air sac of this bird. It is a vivid scarlet color. 4. Lava and cactus characterize the scenery of bleak South Seymour Island. 5. Darwin Bay is named for Charles Darwin, who first described the islands. The ship, with a frigate bird flying over it, was used by an expedition of the American Museum of Natural History.

including the famed William Dampier Here too came Alexander Selkirk (Robinson Crusoe) in 1709 after his rescue from the Juan Fernández islands Buried treasure has been found

After being unclaimed by any nation for nearly 300 years the Galápagos were annexed by Ecuador in 1832 Ecuador s first few attempts to colonize the islands ended in bloody revolts by the settlers who had despaired at the l ard living and iron rule In 1892 Ecuador officially named the islands Archipi lago de Colón Chatham is now the center of government Its only town Progreso is built back in the hills and its few hun lred people grow coffee fruit and sugar cane Wreck Bay on Chatham is the chief port of the islands But fishing vessels from California and elsewhere also anchor at Albemarle and Indefatigable to catch t una To defend the western ap roach to the Pan m Canal in the second W rl l War the Un ted States with the consent of Ecua dor set up naval a r f ses here Area 2 868 square miles population (1950 cen s s) 1 346



GALILEO
Father of Mode n Physics

GALILEO (*găl l le u Itl* an *gä-le lĕ o*) (1564–1642) The first astronomer to work w th the telescope d scoverer of th e pendu lum s laws and founder of modern physics was Gali leo Galilei (usually kno vn as Gal leo) He was bo n in Pisa Italy and died 8 years later within a year of Newton s birth With his telescopes the wonder of h s age he discovered the mountains of the moon four satell tes of the planet Jup ter and the pecul ar appearance of Saturn wh ch was later shown to be due to a g eat ring or a ser es of rings surrounding that planet

When Galileo was a youth of 19 h e saw a lamp in the cathedral at Pisa swinging regularly He realized—what no one had realized before—that a pendu um swinging to and fro could be used to measure time and so laid the foundation for the invention of the modern clock (*see* Pendulum) He also proved that falling bodies however heavy or light fall at the same rate The story goes that he proved this by dropping objects from the leaning tower of Pisa (*See* Gravitation)

Gal leo was a brilliant scholar with a quick and penetrating mind He held the professorship of mathematics in the universities of Pisa and Padua but in 1610 he left Padua for Florence where he lived most of his remaining years

Galileo made his first telescope with a p ece of organ pipe placing a lens at each end It magnified only three times but later he made a telescope that magnified 30 t mes (*see* illustration with Telescope) With these he saw the mountains on the moon s sur face found that the Milky Way was a mass of very fain t stars, and discovered the largest four satellites of the planet Jupiter What he saw through his telescopes also convinced him of the truth of Copernicus view that the earth rotates on its axis and revolves around the sun His ardent support of this view was the cause of difficulties with the church In 1616 he was given a formal warning but nevertheless he again provoked the indignation of the church auth orities by publishing a dialogue on The Great Systems of the Universe which offended by its misuse of Holy Scripture as well as by its biting satire

For this publication he was sum moned before the Inquisition in October 1632 No one knows what happened during his examination but we do know that he uttered a formal recanta tion of his views and was compelled by the tribunal to live in str ct seclusion for the rest of his life There is a story that as he rose from his knees he whispered defiantly Nevertheless it does move —referring of course to the earth but this is a fiction invented more than a century later

During the last e ght years of his long life Galileo lived in retirement near Florence but his interest in science never waned His most admired and perhaps most valuable book Discussions of the New Sciences was publishe l during this period In this work he summarized his lifelong stud es on the principles of mechanics Only when blindness overtook him in 1637 did Galileo lay aside his telescope Still continuing his scientific meditations he dictated notes and correspondence almost to the day of his death Jan 8 1642 He was buried at Florence in the cathedral of Santa Croce where an impressive monument commemorates his brilliant researches

Galileo achieved his greatest reputation as an astronomer but his chief service to science lay in establishing certain fundamental principles of dynam i s such as the law of falling bodies the discovery that the path of projectiles is a parabola the demonstration of the laws of equilibrium and an account of the true principle of flotat on He al o devised an elementary form of the thermometer invented the hydrostatic balance for determining the specific grav i y of solid objects and made improvements in the construction of the microscope Not only was Galileo one of the main founders of modern science by

virtue of his discoveries, but also by virtue of his methods. Rejecting the authority of Aristotle, he observed things for himself and based his deductions on actual tests and mathematical analyses. This is the true spirit of all modern experimental science.

GALSWORTHY, JOHN (1867–1933). When he was at Harrow preparing for college, John Galsworthy was captain of his football team. It is doubtful then whether he had any idea that some day he would be a famed writer. He was probably worried about goals, not novels.

Galsworthy was the son of a successful attorney. He was born at Kingston, Surrey, in England, on Aug. 14, 1867, and grew up not far from London. At school he was not an especially good student. He attended New College, Oxford, and was described as "lazy, dressy, and sporting." But later he took honors in his law studies and became a member of the bar.

He did not work at his law practise; instead he traveled to such places as Egypt, Fiji, Australia, and America. On one trip he met a ship's officer who shyly showed him a half-finished novel. The officer later became famous as Joseph Conrad; and the two became lifelong friends.

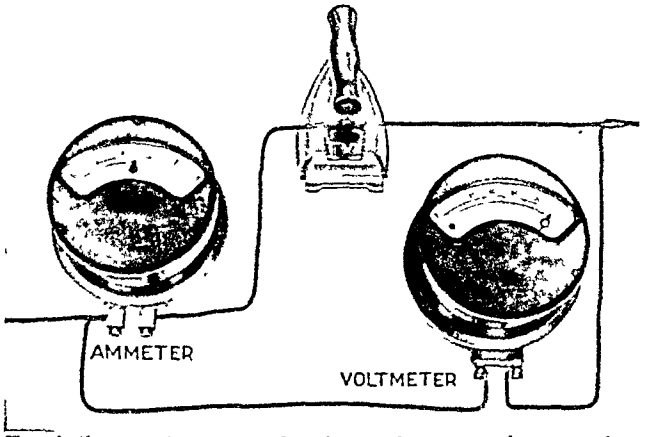
Back in England, Galsworthy settled down to write. He published four novels under the pseudonym of "John Sinjohn." The stories were weak, but they were good practise for him. In 'Man of Property' (1903) he showed his first real greatness. The story grew into a series of three novels, now called 'The Forsyte Saga'. It deals with Soames Forsyte, who thinks of his wife as a piece of property. In these books, Galsworthy criticizes the selfishness of the English property-owning class. He shows the people of this class as being more interested in property than in human beings. Three later novels about the Forsytes were published as 'A Modern Comedy.'

Galsworthy also won fame as a serious playwright. 'Strife,' 'Justice,' and 'Loyalties' are his best-known plays. In 1932 he was awarded the Nobel prize for literature.

GALVANOMETER. On the dashboard of every automobile is an instrument that tells when and how much the battery of the car is charging or discharging. This is an *ammeter* and, like the *voltmeter* and *wattmeter*, it is a member of the galvanometer family.

Most of these instruments for use with direct current are built on the D'Arsonval principle. A small coil of fine wire is pivoted between the poles of a permanent magnet. Two small springs hold this coil in a neutral position and also serve to carry current to it. When current passes through the coil the latter becomes an electromagnet (*see* Magnet), whose north and south poles are repelled by the adjoining poles of the permanent magnet (as shown in the picture), then attracted by the opposite poles, if the coil is moved far enough. This causes the coil to turn on its pivots against the pull of the springs. The degree of this movement, usually indicated by a pointer and scale, is a measure of the current.

AN AMMETER-VOLTMETER HOOKUP



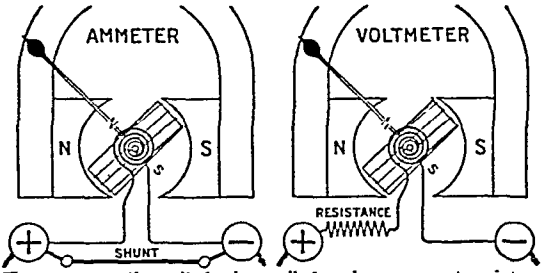
Here is the correct way to test the voltage and amperage of current taken by an electric iron. The current flows through the ammeter (series connection) and the iron. The voltmeter is connected in parallel.

The ordinary ammeter is a galvanometer connected in series with the circuit to be measured. Most of the current passes through a strip of metal called a shunt, but the small part that goes through the resistance offered by the moving coil is always a proportional measure of the main current. The voltmeter is a galvanometer of very high resistance. It is connected across (in parallel with) the circuit so that the current it allows to pass is proportional to the voltage.

For use with alternating current, the permanent magnet may be replaced by a fixed coil which takes current from the same circuit as the moving coil. Since the polarity of the fixed coil alternates at the same instant as that of the moving coil, the direction of the magnetic action remains constant. A cheaper instrument consists of a fixed coil which draws a light iron core inward regardless of the direction of the current. In the "hot-wire" ammeter the expansion of a fine wire as the current heats it moves a pointer over a scale.

In a wattmeter a fixed coil is connected to the

TWO USES FOR A GALVANOMETER



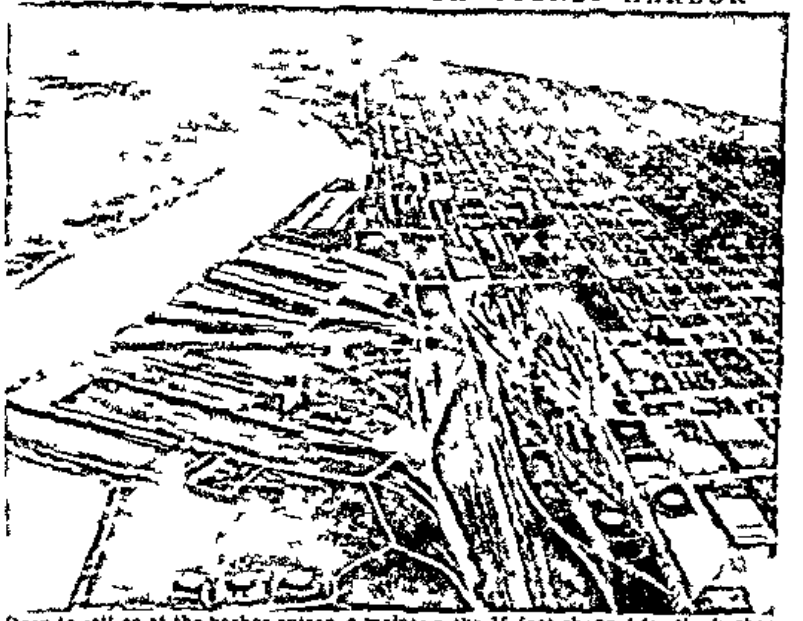
Here you see the coiled wire, coiled springs, magnet, pointer, and scale described in the text as making a direct current galvanometer. Note how a shunt makes the instrument an ammeter, while a high resistance makes it a voltmeter.

circuit in series and a *moving coil* in parallel The resultant movement of the needle depends on both the amperage and the voltage thus giving a reading in watts

GALVESTON, TEX In 1900 the city of Galveston suffered one of the worst disasters in American history On September 8 a West Indian hurricane blowing 120 miles an hour struck the city and in a few hours practically destroyed it Meanwhile huge waves swept in from the Gulf of Mexico drowning some 5 000 people

But Galveston refused to yield to the ocean The people immediately began building a gigantic concrete sea wall fronting the Gulf for 7½ miles They put houses on stilts and elevated car lines Then they raised the entire city 17 feet by pumping in almost 20 million cubic yards of sand from the ocean bed

GALVESTON'S DEEP AND SHELTERED HARBOR



Granite jetties at the harbor entrance maintain the 35 foot channel for the harbor at the north end of the island Its piers can berth 100 ships at a time and it is well equipped with warehouses grain elevators and transfer facilities

Today Galveston is one of the world's great ports Standing on Galveston Island it has a deep natural harbor Vessels approach the harbor through three miles of granite jetties which maintain a 35-foot depth in the channel Municipally owned docks provide more than 30 piers for loading and unloading ships Each year Galveston exports large quantities of crude sulphur cotton flour and wheat Incoming vessels bring cargoes of bananas and sugar Other industries in the city include flour and rice mills shrimp fisheries and dry docks for shipbuilding and repair

The rebuilding and elevation of the city brought better drainage and improved health conditions Galveston is now a famous seaside resort attracting more than a million visitors every year Its recreational facilities include a paved boulevard and promenade along the inside of the sea wall On the gulf are many miles of sandy beaches for swimming Pleasure Pier extending a half mile into the Gulf contains an exhibit hall a stadium and an auditorium

The city is located on the eastern end of Galveston Island which is 30 miles long and two miles wide It is connected to the Texas mainland by a two mile concrete causeway constructed 25 feet above the Gulf Another causeway carries the traffic of five railroad lines A large airfield built by the army during the second World War is used as the municipal airport

Galveston was named for Count Bernardo de Galvez, Spanish viceroy of Mexico who directed exploration of the bay in 1786 From here Jean Lafitte sailed his pirate ships between 1817 and 1821 The town was incorporated by the Republic of Texas in 1839 During the Civil War the port was blockaded and taken by Union naval vessels then won by the Confederates in a bitter battle Jan 1 1863 The commission form of government was adopted in Galveston after the 1900 hurricane It proved to be so successful that it has been widely copied (*see* Municipal Government) The city is one of the South's largest medical centers maintaining five hospitals The University of Texas Medical School is located here Population (1950 census) 66 568

GAMA (*ga'mä*) **VASCO DA** (1460? 1524) For more than 60 years Portuguese explorers had been creeping down the west coast of Africa trying to find a route to India By 1488 they had reached the Cape of Good Hope (*see* Diaz Bartholomew) Then Spain entered the race by sending Columbus sailing westward and the first reports seemed to show that he had indeed reached the Indies Thereupon the Portuguese king summoned Vasco da Gama a discreet man of good understanding and with great courage for any great deed He was also a gentleman of the king's household and of noble lineage a veteran soldier and a skilled mariner

To Da Gama was entrusted a fleet of four small vessels His brother Paulo was placed in command of one of them On July 8 1497 they set sail from Lisbon Da Gama was determined to round the Cape of Good Hope which Diaz had called the Cape of Storms and cross the Indian Ocean

There was good reason why seamen before Diaz and Da Gama had failed to find an eastward passage to India One was an old superstition still believed by many that no man could live in equatorial heat Another was that along the whole west coast of Africa there were few inlets where ships could put in to ride out storms and to fill their water casks on the long voyage But the worst deterrents were the doldrums and the southeast trade winds (*see* Winds) The first kept vessels becalmed in equatorial waters for a long period If they finally traversed the doldrums the steady southeast trades blew directly

ROUNDING THE CAPE OF GOOD HOPE



A proud moment for Vasco da Gama came when he gazed at the long-sought Cape of Good Hope. This picture is from a mural by J. H. Amshewitz in the South Africa House, London.

against their track. Then too they feared they would have to fight the northeast trades on their return.

But Da Gama ignored all dangers. From the Cape Verde Islands he set a course through the South Atlantic that carried him within 600 to 800 miles off the bulge of Brazil. It took four months of battling head winds and currents to pass the Cape of Good Hope. Here the crew, weary of months at sea, begged him to turn back. Da Gama refused; and the crew threatened mutiny. He then pretended to agree, saying that they must have a document listing reasons for turning back to present to the king. As three leading seamen came into his cabin to sign the document, he had them clapped in irons. Then he ordered the master and the pilot to hand over their navigation instruments, threatening to execute the seamen if they refused.

Da Gama threw the navigation instruments into the sea. He told the crew that God would be their navigator and that they must go on. He finished his speech coldly with the words, "Henceforth let no one speak to me of putting back, for know from me a certainty, that if I do not find information of what I have come to seek, then to Portugal I do not return."

It took Da Gama another four months to sail up the east coast of Africa. He reached Malindi, in what is now Kenya, in April. There he met Indian traders who gave him a pilot for the rest of the voyage. In May 1498 he landed at Calicut on the west coast of India. His reception by the ruler of the city was not at all friendly, but he saw enough to convince himself of the immense wealth of the country before he began his homeward journey.

Scurvy had killed 115 out of his crew of 170. When the 55 survivors arrived in Lisbon in September 1499, however, they were given a splendid reception. Vasco da Gama was granted the coveted title *dom*. His pensions and facilities for trade with the Indies made him one of the richest men in the kingdom.

In February 1502 Da Gama set sail a second time for India. He returned in September 1503 with the first tribute of gold from the East. Again money and honors were heaped upon him. Unlike Columbus, Da Gama enjoyed favor as an adviser to the king and was made count of Vidigueira in 1519. Five years later he was sent as viceroy to India. Old as he was, he set out to reform abuses in the colonial government, but he died within a few months.

His voyage had brought his country immense wealth. As a result of his exploration Portugal had become one of the foremost powers of Europe, because it controlled the route to the Indies. As Columbus opened the way to the West and its ultimate wealth, so Da Gama, in the same decade, opened the way to the East and its immediate riches.

GAMES *New and Old for* PLAYERS *of All* AGES

GAMES. It is difficult, if not impossible, to trace the origins and originators of games from the obscure past. They are as old as civilization itself. In every part of the world, games have been a real force in the growth of our culture. They have sprung from events in the lives of people—some tragic, some happy and commonplace. Many games are outgrowths of religious ceremonials and rituals; some are from the preparation for and waging of war. Still others are the result of mythology, folk customs, social habits, politics, or commerce. The young and the old can be found playing games anywhere in the world today—just as they have always done.

Though the situation which first brought a game into being may be lost with the passing of time, the game pattern itself often survives. It may be known by different names in various lands at different times. Hopscotch, Blind Man's Buff, and Tug-of-War were as popular among the children of ancient Rome as they are in schoolyards and back yards today. In the time of the Roman Empire, Blind Man's Buff was called *Murinda*. The German youngster calls this same game Blind Cow while the little Spaniard thinks of it as Blind Hen and the London child may know it as Hoodman Blind. Running, jumping, throwing, swinging, as well as many forms of ball and kite-flying games, are standard among games of many lands.

Importance of Games

Games could not have survived so many centuries if they were not important, even essential, in the lives

of people The desire to play is universal and personally satisfying Playing games is one of the many ways of giving vent to the need for self expression and of providing release from the tensions of reality Games stimulate the whole person and contribute richly to people s physical mental and sometimes spiritual development (*see* Play) When the rules of the game are observed as they should be the social values of the game are incomparable The game provides a common meeting ground for groups enabling each participant to better understand himself and others The spirit of the game—especially a team game—calls for the cooperation sharing and compromise needed in everyday life Thus it is clear that games *can be a way of opening new roads of appreciation* understanding and learning While playing games is an effective way of developing one s will and determination to forge ahead games can also be invaluable in teaching restraint and self control

Kinds of Games

Some games are simple calling for little skill and preparation while other games are highly organized and require full-dress arrangements including special equipment facilities and training Many games are competitive They may require strength persistence or skill Some are creative and expressive in nature All give the player some degree of satisfaction

There are games for the home the back yard and the neighborhood These and other games are played on the playground at the park or at the community center Get acquainted games or icebreakers are *popular among folk* who may not know each other well Some games are active and others quiet There are nonsense games and *stunts as well as countless* musical games Games can be found which one individual can play alone *Most require two or more* persons or a small group In a few almost any number of persons who are within hearing distance can play together Games have been designed for children of different ages and for adults *Games for small children* do not require the element of competition The young

LEARNING TO PLAY LONDON BRIDGE



This small boy is proud to join his older brother and sister in the game the generations before him enjoyed playing Children of medieval Europe played this ancient musical game

sters get pleasure from dramatic play—acting out simple stories or imitating common things Singing games have given joy to children through the centuries They aid in the rhythmic and social development of the young In addition to the multitude of games requiring no special equipment the stores offer thousands of board games card games and other special games Some of the *commercial games such as Parcheesi* are as old and as widely beloved as the folk games Yet fresh novelties take the public fancy every year

ACTIVE GAMES IN THE CLASSROOM AND ON THE SCHOOL GROUND



These primary school children are singing Farmer in the Dell as they circle to recorded music The seated youngsters have been chosen as farmer wife child and so on as the song directs



The school ground is a fine place for a running game such as Shoulder Tap The children find fun and vigorous exercise racing it around the wheel for a place in the spoke line

Games are successful when they are understood and when they are enjoyed. They are worth the time it takes to learn them. Games can and should be taught easily and quickly. Here are points to keep in mind:

1. Games should be carefully selected with respect to age and sex interests as well as to the conditions under which they are to be played.
2. Supplies or equipment required for the game should be prepared beforehand.
3. Game directions and rules should be given clearly, simply, and briefly.
4. If formations are required for the game, they should be illustrated or demonstrated.
5. The game should be started with a minimum of suggestions, and the players' questions answered as the game continues.
6. The game should be discontinued *before* and *not after* the player has lost interest in it.

Rules are given here for types of games which have proved to be popular with various age groups and which can be informally played with little or no equipment. The active games are those requiring running or other fairly strenuous exercise. The quiet games are quiet in the sense that no running about is required. They may be very noisy. The grade level at which each is popularly played is indicated.

Instructions for Active Games

Bull in the Ring (Primary)—One person is chosen as the *bull*. The players form a ring around the bull, holding hands. The bull tries to break through the circle. He may rush, lunge, or pull to try to break the ring. If he breaks through and escapes, the players chase him. Whoever catches the bull takes his place. The bull may not duck under the chain of arms.

Cat and Rat (Primary)—The players hold hands and form a circle. One player is chosen as *rat* and he stands inside the circle. Another player outside the circle is selected to be the *cat*. The cat tries to catch the rat. Players help the rat and hinder the cat by raising or lowering their arms and by trying to prevent the cat from breaking through the ring. Several persons can serve as cats and an equal number as rats for variations.

Clap in, Clap out (Intermediate)—Teams are chosen and line up at opposing ends of a playing space, 30 to 50 feet apart. One team sends a *tapper* to the opposing side. The players on this side stand with both feet back of their line with one hand outstretched, palm up. The tapper walks along this line. He taps each hand, in turn, until he decides which player he wants to chase him. When he decides he quickly slaps this person's hand hard. The tapper then runs quickly to his own line. If he arrives before the chaser can tag him he is safe. If not, he joins the opposing side. The tapper may feint at hitting a hand hard and then hit it gently in order to fool his opponents.

Flying Dutchman (Primary)—The players form a ring by couples. Couples then hold hands. One couple stands outside the circle. Joining hands they start around the circle. Soon, and as a surprise, they slap the hands of a couple in the circle and continue around the circle in the same direction. The couple slapped starts running immediately in the opposite direction continuing to hold hands as they run. When the couples going in opposite directions meet it requires quick thinking to avoid a collision The first couple back to the open position in the circle remains in it. The pair that arrived too late continues the game.

BUILDING MUSCLES WITH DODGE BALL



The children around the circle try to hit the feet of the three in the center with the ball. If a "dodger" is hit he exchanges places with the one who struck him.

Guarding the Treasure (Intermediate and Junior High)—Use a volleyball, or play ball, or tin can. This *treasure* is guarded by one player who is "it." He is the *defender*. The others are the *enemy*. The defender stands directly over the ball, or treasure. One foot is placed on each side of it. The defender can stand directly back of the treasure or he can maneuver around it. The other players circle about attempting to get the treasure by kicking it away from the defender without being tagged by him. If the defender tags any player before another kicks the treasure, the tagged player then becomes the defender. If an enemy succeeds, another player immediately kicks it, and all the enemy pursues the ball, kicking it. The enemy tries to prevent the defender from regaining it and standing guard over it as before. The defender alone may touch the treasure with his hands.

Ocean Wave (Intermediate, Junior, and Senior High)—The players sit in a circle. One chair is vacant. A player stands in the center of the circle. He shouts, "Slide left!" or "Slide right!" At these commands the seated players move to the left (or the right, as called) to fill the vacant chair next to them. "It" tries to occupy the vacant seat and continues until he gets it. The location of the vacant seat changes constantly as the players move into it when "it" comes next to them. When "it" gets a seat

A PLACE FOR GAMES IN A CROWDED CITY



These tenement children find a vacant lot a good place to play because diagrams for Hopscotch, Shuffleboard and other court games have been prov ded The Po ice Athletic League of New York C ty equ ps and supervises such playgrounds

and the call has been Slide left the player to it s right becomes it

Pilfering Sticks (Intermediate and Junior H gh)—Divide players evenly into t vo s des *Home bases* are des gnated by drawing or selecting existing lines at each side and from 30 to 60 feet apart To the rear and in the center of each base line is the *prison* five feet wide and about three feet deep In front of the prison and three feet in front of the base line is a zone in which four st cks are placed

One side sends out a player to dare his opponents When one of the opposing side starts after him he runs for *home* If he reaches home before being tagged he is safe If the runner is tagged before he can return home he becomes a prisoner and goes to the prison If a player tags an opponent thus making him a prisoner the tagger may return home safe Prisoners can be released if a runner from their s de tags them Prisoners must keep one foot in prison but may stretch out their hands to be tagged

When a player gets to his opponent s goal where the sticks are placed he p cks one of them up and *takes it back to his own team s goal* He may return safely to his home base When players are in prison the st cks cannot be taken until the prisoners are released The first side to secure all the sticks from the opposing side wins the game

Pom Pom Pullaway (Intermediate and Junior High)—*Mark lines 30 to 50 feet apart.* Curbs trees or other markers may be used for the lines All players *stand on or behind a line* A player chosen as it stands in the center of the playing area and shouts

Pom Pom Pullaway!
If you don t come *I ll pull you away*

Upon hear ng th s all the players leave the safety zone and run across to the opposite line It tries to tag as many as poss ble before they reach the safety line When tagged the players join it in catching other players as they dash across the open space The game ends when all are caught

Run, Sheep Run (Intermediate)—Choose t vo equal s des Each s de selects a captain A home base is selected One group is the *sheep* They leave and hide Their captain comes back when they are ready and accompanies the oppos ng side as it hunts for the sheep When the cap ta n thinks the t me appropriate he shouts Run sheep run! All the sheep rush for home base immedi ately So do the *seekers* If the sheep beat the seekers to home base they hide again f not the seekers become sheep in turn

Shoulder Tap (Intermediate)—The players are d vided into groups of five to eight and arranged as in spokes of a wheel with the players fac ng the center or hub There is one extra player who is it It goes around the circle and taps one of the end men on the back The end man taps the person in front of him and so the tap is passed until the player at the hub end is h t He calls Hip and at this signal all players in that line run around the c rcle to the right outs de of the players and try to get back quickly into their orig nal posit ons It also tries to get into one of the posit ons The player left without a place is it for the next game Players may *not* start to run before the s gnal Hip is called

Spud (Junior and Senior H gh)—Use a soft ball a tennis ball or volleyball The leader bounces the ball and at the same time calls the name of a player That player recovers the ball while all other players scatter as fast as they can He tries from the point of recovery to hit another player with the ball Each m ss counts one *spud* against the player who m sses After missing the thrower must recover the ball and throw again until he hits another player Three spuds puts h m out When a player is h t he recovers the ball and attempts to hit someone else If a player gets three spuds against him he bends over against a wall and all the other players have the fun of taking one shot at him with the ball

Stagecoach (Intermediate)—Players are seated in a circle Each player takes the name of some part of a stagecoach—wheel axle seat re ns harness brake horses driver baggage and the like One per son is chosen to tell a story about a stagecoach and in telling it brings in all the different th ngs related to the stagecoach As each item is mentioned the player representing it gets up and runs around his

chair. At some point in the story the storyteller yells, "Stagecoach!" When he does, everyone must leave his seat and scramble for a different one. The storyteller attempts to locate a seat during the change. The player not finding a seat begins a new story. This game may be played as "Automobile," with players taking the names of parts of a car.

Statues, or Red Light (Primary)—The players form a line. One player is chosen as "it" and he stands some distance ahead of the line. He covers his eyes as he counts from one to ten. The players try to go from one side of the room or area to the other while "it" counts to ten. When "it" has counted to ten he looks up suddenly. Any player caught in motion must go back to his starting place. The other players hold whatever position they may happen to have at the time, statuelike. The first player to cross the room is "it" for the next game.

Three Deep (Primary)—The players stand in a circle two deep, facing the center of it. Two players on the outside of the circle and at a good distance from one another begin the game as runner and chaser. The runner saves himself from being tagged by stepping in front of one of the pairs of players, thus making the circle at that point three deep. The outside player in the three-deep row leaves immediately or is tagged. When a player is tagged he becomes the chaser. A runner may run in any direction he chooses, to the right or left or across the circle. He may not leave the general area of the circle. The runner can step only in *front* of a player and make the circle three deep by moving from the outside into the circle and to the right.

Rules for Quiet Games

Battleship (Junior and Senior High and Adults)—This game can be played by two individuals or two groups. Each player or team has three charts: No. 1 to record the enemy's shots on his ships, No. 2 to record shots at the enemy's ships, and No. 3 to record successful shots, or *hits* (*see* diagram).

Each player or team secretly locates his ships in the first chart using four *consecutive* spaces for a battleship, three consecutive spaces for a cruiser, and two consecutive spaces for each of his submarines. (If the charts are enlarged, the number of spaces increases, the number of ships, and hence the number of shots allowed, also increase.) Ships may be located on the chart vertically, horizontally, or diagonally. Opposing players or teams do not know where the opponents have placed the ships.

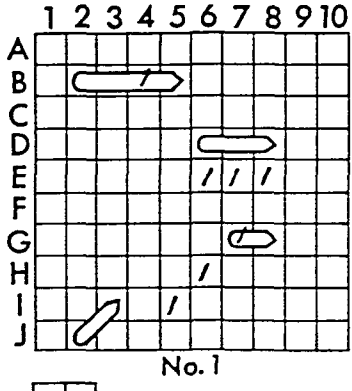
Each player or team at the start shoots a volley of seven shots at the enemy's ships. Three shots are allowed for the battleship, two for the cruiser, and one each for the submarines. For example, the *first* player or team calls his shots as follows: "I am shooting at A1, B2, C3, D4, E6, F9, and G10." As he shoots he records his shots, by volley, on the second chart using the figure "1"—meaning the first volley. Simultaneously, the opponent marks a "1" in each place called by the first player, on the chart where his ships are located (his own No. 1 chart). After each volley, the player whose ships were being attacked tells the opponent how many hits he has scored and on what type of ship. The *location* of the ships, however, is not revealed. He need say no more than, "You hit my battleship twice and sank a submarine." Truthful answers must be given. His opponent records this information on Chart No. 3.

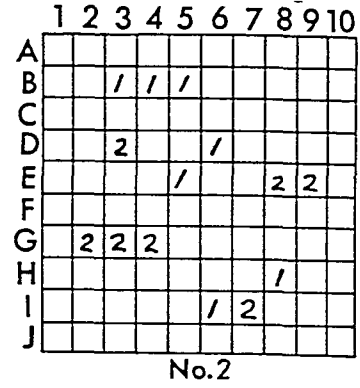
Then the second player shoots a volley of shots at his opponent in the same manner. On the second, third, and fourth volleys, the figures "2," "3," "4," are used to record the shots. A close study of the shots helps the shooter to locate the enemy's ships. If the battleship, for example, has a "1" and "3" volley shot on it, he looks for a "1" and "3" sequence on his chart for a clue as to where to place his next shots. When a ship is sunk, the player or team losing the ship also loses the number of shots he was allotted for that particular type of ship in the beginning. A player losing his cruiser, for example, will be reduced to a total of five shots on the next volley. A player is defeated only after *all* his fleet is sunk.

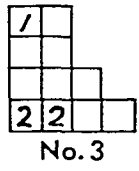
Button, Button, Who's Got the Button? (Primary)—The players are seated in a circle with one player in the center. In the circle is a button which the players try to pass back and forth undetected. They keep their hands in motion constantly as if they are receiving or passing the button. The center player tries to guess who has the button. The player caught with the button takes his place.

Fisherman (Primary and Intermediate)—The players sit around a table or on the floor. One player

CHARTS FOR KEEPING SCORE IN BATTLESHIP







Each player in Battleship has three charts like these. On Chart No. 1, Player X places his battleship (using four spaces); cruiser (three spaces); and two submarines (two spaces each). He uses Chart No. 1 to spot the shots in each enemy volley. He locates his own shots at his enemy's ships on Chart No. 2, by number of volley. When Player Y reports that X has hit one of his ships, X records the hits on Chart No. 3. Player Y marks his charts by the same rules.

is chosen to be the *fisherman* He is given a short stick (fishing pole) to which a piece of string is attached the string being tied at the end in a loop The fisherman drops his line in such a way that the loop lies on the table near center (Be sure that the loop tightens easily when the string is pulled) When the fisherman says Whose fish? all the players put the tips of their forefingers on the table inside the circle formed by the string Quickly the fisherman calls My fish! and pulls in his line All players try to withdraw their fingers before they are caught in the loop The fisherman must pull in his line very quickly in order to make a catch Last player caught becomes the fisherman

Ha-Ha (Primary and Intermediate)—The players sit in a circle The first player starts by saying Ha The second player says Ha Ha The third says Ha Ha Ha And so it goes around the circle while each player adds another Ha The Has must always be pronounced solemnly without any trace of a smile If the player laughs or smiles he is out of the game Soon the room is filled with laughter

I Like (Intermediate and Above)—The leader says I don't like tea but I like coffee It goes from player to player each saying I don't like tea but I like If a player calls any word which does not have a double letter in it the leader says No I don't like that I like apples but I don't like pears I like books but I don't like pencils Therefore I don't like anything without double letters in it The players will gradually see the point.

Nature Hunting (Intermediate and Above)—Players in turn say Guess of what tree I am thinking Guess what bird Guess what flower Guess what insect Guess what river what mountain Hints may be given to help the group locate the particular subject The person may say for example The insect I am thinking of likes honey and can sting The player who guesses correctly gets a chance to pick a subject

Palmistry Fine (Junior High and Above)—Each player holds his left hand flat on a piece of paper and outlines it with a pencil The back of the paper is marked in some special way so that it can be identified later Papers are gathered shuffled and then distributed Each player writes the description of a person who might have such a hand Papers are shown and identified and the owner of a hand must stand while the description is read aloud to the group

Sardines (Junior High and Above)—One person is it and hides from the other players The players scatter and hunt it each player hunting alone As a player finds it he hides with him He is careful however not to reveal the hiding place to the others If he sees others near at the time he may go on as if still seeking and come back at a favorable opportunity As they discover where it is hiding each player crowds in to the same hiding place The hunt continues until all the players find the hiding place

Spell Down (Intermediate and Above)—The players form a circle One player starts a word by stating the first letter The next player adds a letter He may or may not be thinking of another word Words must have at least three letters in them The player who completes a word must imitate a goat Any player may challenge the one who precedes him if he questions that the player has a word in mind If he has a legiti-

QUIET GAMES FOR THE SCHOOLROOM



Do this! cries the leader and the primary school pupils seated at their desks follow her gesture If she says Do that!' however they must not imitate her movement for they are out of the game after making three such mistakes



Games such as Guess My Name help first graders learn to read A word they know has been written on the tag each wears. The small girl whispers a chosen word to the boy When he finds the word on a schoolmate's tag, he becomes the questioner

mate word in mind the challenger becomes a goat. If he has not, the challenged player is a goat. When a player once becomes a goat he must "baa-aa-aa" each time his turn comes instead of adding a letter.

Twenty Questions (Junior High and Above)—A player leaves the room. The others select an article or object. When the player returns, he tries to discover by questioning what it is. He is allowed 20 questions. He might first try to locate it. "Is it in this room?" "Is it in this state?" When he locates it he may try to find out something of its nature. "Is it human?" "Is it inanimate?" When he thinks he knows what it is he names it. If he is correct another player leaves the room and the game continues. If he is wrong he asks more questions until he has used 20.

Very, Very Tall (Primary)—One player closes his eyes. The other says, "I am very, very tall, I am very, very small; sometimes I'm tall; sometimes I'm small. Guess what I am now." He stands or stoops. The player with the closed eyes guesses whether the other is tall (standing) or small (stooping). He continues until he guesses correctly. Then the other player guesses. If the game is played by a group, "it" stands in the center. The whole circle stands or stoops. If "it" guesses correctly he chooses someone to take his place.

Wheel of Fortune (Intermediate and Above)—A wheel is drawn on paper. Between the spokes, numbers are written, one number for each space—one, two, three, five, eight, ten, and the like. Each player, in turn, takes a pencil or piece of chalk, twirls it in the air saying:

"Tit for tat,
Butter for fat,
If you pet my dog,
I'll pet your cat."

At the word "cat," the player lets the pencil fall on the wheel. The number written in the space where the pencil point lies is the score. If the point lies on a line or outside the circle, nothing is scored. Each player takes his turn. Any number of points over 35 may be considered a game.

Who Am I? (Intermediate and Above)—"Who am I," asks one of the players. Other players ask such questions as "Are you dead?" "Alive?" "Are you a man?" "Are you a political figure?" "Are you fictional?" "Are you married?" and so on. Finally some player guesses the name of the person. The player who guesses correctly calls out, "Who am I?" and the game continues. Historic figures, characters in fiction or in the theater, or present-day persons may be used.

Who Is Knocking? (Intermediate and Junior High)—One player sits on a stool in front of the group. He closes his eyes tightly and holds his hands over them. Another player in the group knocks on the floor behind him.

"Who is knocking at my door?" he calls.

"It is I," the player who knocked answers, disguising his voice.

The player on the stool tries to guess who knocked. He gets three guesses. If he guesses correctly, the two players exchange places and another knocker is chosen.

DOMINOES, A HOME GAME FOR ANY AGE



These children are enjoying Dominoes, an old favorite among the many commercial board and table games. To start, all players have seven "pieces," which they play in turn by matching the "spots." They fill their hands by drawing from the "boneyard."

Books about Games

Bancroft, J. H. Games (Macmillan, 1937).
Borst, Evelyne. Book of Games for Boys and Girls (Barnes, 1953).
Harbin, E. O. Games for Boys and Girls (Abingdon-Cokesbury, 1951).
Hunt, S. E. and Cain, Ethel. Games the World Around (Barnes, 1950).
Kohl, Marguerite and Young, Frederica. Games for Children (Wyn, 1953).
Leeming, Joseph. Real Book of Games (Garden City, 1953).

GANDHI (*gän'dē*), **MOHANDAS KARAMCHAND** (1869–1948). Throughout history most national heroes have been warriors, but Gandhi ended British rule over India without striking a blow. A frail, wizened man, he devoted his life to peace and brotherhood. Yet less than six months after his "nonviolent" resistance to British rule won freedom for India, he was shot down by an assassin.

Gandhi's life was filled with contradictions. He was one of the gentlest of men, a devout and almost mystical Hindu. But he had an iron core of determination and nothing could change his convictions. This combination of traits made him leader of India. Some called him a master politician. Others believed him a saint. To millions of Hindus he was their beloved *Mahatma* (Great Soul).

Gandhi was born Oct 2, 1869 in Porbandar near Bombay His family belonged to the Hindu merchant caste (Vaisya), and his father had been prime minister of several small native states He was betrothed at the age of seven and married when only thirteen

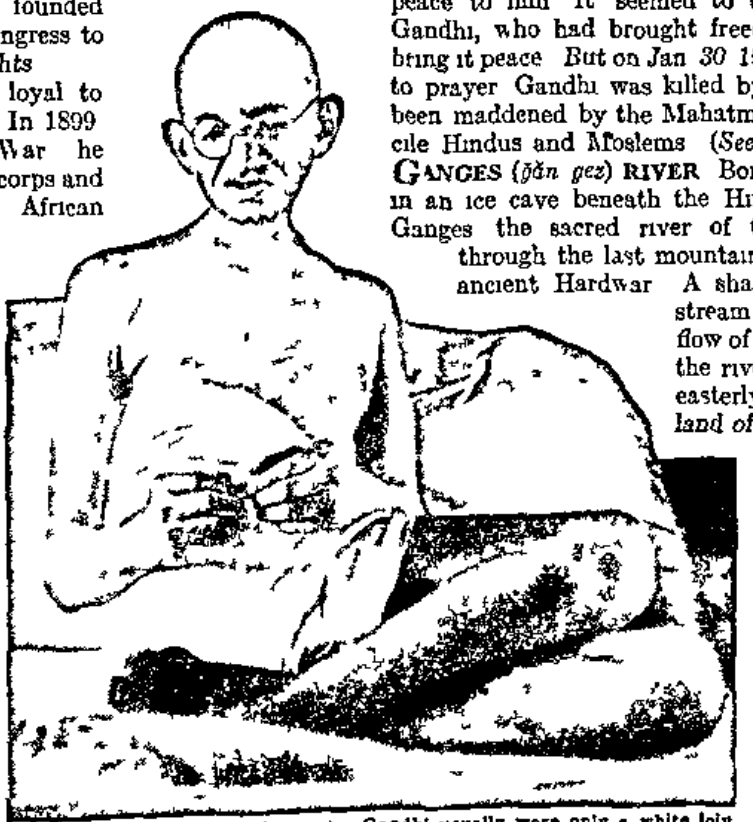
When the boy was only 19 he defied caste restrictions by going abroad to study As a law student at University College in London he was snubbed because he was an Indian Instead of becoming embittered, he turned his lonely hours to studying philosophy Included in his reading were such doctrines as Tolstoy's belief in nonresistance, Thoreau s practise of civil disobedience," and Ruskin s urge to forsake industrialism for agrarian life These fitted in excellently with many Indian religious ideas

In 1891 Gandhi was admitted to the bar, but returned at once to India Unsuccessful in Bombay he went to South Africa in 1893 At Natal he broke precedent by being the first colored lawyer admitted to the supreme court He then built a large practise

But his interest soon turned to the plight of fellow Indians who had come to South Africa as indentured laborers He had seen how they were treated as "inferiors" in India in England and now in South Africa In 1894 he founded the Natal Indian Congress to agitate for Indian rights

Still he remained loyal to the British Empire In 1899 during the Boer War he raised an ambulance corps and served the South African government Again, early in 1906 he gave aid against the Zulu revolt Both times he received medals of honor

Later in 1906 however, Gandhi began his peaceful "revolution," declaring he would go to jail or even die before obeying an anti Asiatic law Thousands of Indians joined him in this 'civil disobedience' campaign and twice he was imprisoned Yet in the first World War he again organized an ambulance corps for the British before returning home to India in 1914



In keeping with his vow of poverty Gandhi usually wore only a white loin cloth made of cotton spun in his own hut He thus symbolized the poverty of India s millions

Gandhi's writings and devout life drew masses of Indians At last they had found a leader who believed in their human and spiritual worth Almost blindly they followed him in his campaign for *swaraj* (home rule) He worked to reconcile all classes and religious sects, especially Hindus and Moslems In an effort to smash barriers against Untouchables, he brought many to live in his mud walled village

In 1919 he became a leader in the newly formed Indian National Congress In 1920 he launched a noncoöperation campaign against Britain, urging Indians to spin their own cotton and to boycott British goods, courts and government This led to imprisonment (1922-24) In 1930 in protest of a salt tax Gandhi led thousands of Indians on a 200-mile march to the sea to make their own salt Again he was jailed

In 1934 he retired as head of the Indian National Congress but remained its actual leader Gradually he became convinced that India would receive no real freedom as long as it remained in the British Empire Early in the second World War he demanded immediate independence as India's price for aiding Britain in the war Again he was imprisoned (1942-44)

Gandhi s victory came in 1947 when India won independence But like his life victory was a contradiction Independence split India in two and brought fierce Hindu Moslem riots Again Gandhi turned to nonviolence fasting until Delhi rioters pledged peace to him It seemed to the world that only Gandhi, who had brought freedom to India, could bring it peace But on Jan 30 1948, while on his way to prayer Gandhi was killed by a Hindu who had been maddened by the Mahatma s efforts to reconcile Hindus and Moslems (*See also* India)

GANGES (*găn gez*) **RIVER** Born in northern India in an ice cave beneath the Himalayan snows, the Ganges the sacred river of the Hindus breaks through the last mountain barrier just above ancient Hardwar A shallow, rapidly falling stream before it gains the flow of its many tributaries, the river keeps to a southeasterly course through the *land of the little, talkative* Jats, busy in *gram* (chick pea) and indigo fields to Cawnpore, that blackest spot on the Indian conscience For here on a flight of steps Massacre Ghat leading down to the Ganges 600 women and children were killed during the Indian Mutiny of 1857

When one-half of its journey through the most densely populated region of the world is done, the Ganges is joined by a sister stream, the Jumna Their *doab* (land between two rivers) is irrigated by *two elaborate and costly canal systems fed from the* Ganges Allahabad on the point of land thrust out into

their united swirling waters, is a holy of holies to the Hindus, the true place of pilgrimage, where the festival known as the "Maghmela" is held. Here the river becomes deep enough to bear all sorts of small native craft and it is navigable throughout the remainder of its 1,550-mile journey to its mouths on the Bay of Bengal.

In a great circle the powerful stream sweeps past Benares. The banks are crowded with temples, whose *ghats* (steps) creep with pilgrims of every caste and rank, struggling to wash away their sins in "Mother Gunga," to cast the ashes of their dead into its current, or to capture a small vial of its purifying liquid to carry back to distant homes.

Swelling with the force of new tributaries, it flows past village and city until it meets the powerful Brahmaputra, whose black load of silt assists in the unceasing building up of its extensive delta. This delta begins more than 200 miles from the Bay of Bengal, and the river stretches myriad fingers of tiger-infested crocodile swamps southward to the sea. Chief of its channels is the Hooghly on the west, bearing majestic ocean liners 80 miles to busy Calcutta. Here the stream is choked with narrow native canoes with tiny deckhouses and fat barges topped by bamboo cottages, unloading the plentiful output of India's plains. Constant dredging is needed to keep the channel free of silt.

India worships "Mother Gunga," just as ancient Egypt deified the Nile, because it gives life to the millions that swarm the 390,000 square miles of its fertile basin. When the summer rains beat down, every tributary of the Ganges rolls in a flood down to the holy river. The muddy waters creep across the broad flood plain, mile upon mile, deepening to 60 feet in places. When the rains have spent their force, the deluge recedes, leaving a new layer of rich soil on millions of tiny farms. Rice, wheat, cotton, jute, spices, and other crops spring from the soft, warm loam, feeding almost as many people as live in both North and South America, and sending rich exports around the world.

BORN TO SKIM THE SEAS



These white gannets began life in a seaweed nest on a precipice such as this one. Destined to roam the seas, they know no other home than the bleak rocky ledges above the roaring surf.

GANNET. While the snow still clings to the cliffs of Bird Rock and Bonaventure Island in the Gulf of St. Lawrence, large sea birds come in flocks to build their nests on the wind-swept ledges. They are gannets (*Moris bassana*), with pure white plumage and black wing feathers, measuring about 35 inches in length. This species, which also nests on several islets off the coast of the British Isles, is the only northern representative of the gannet and booby family *Sulidae*, the remaining ten species being distributed over tropical and subtropical coasts.

Gannets and boobies are sea dwellers and fishermen. The white-bellied booby (*Sula leucogaster*), found on the Bahaman Keys in large colonies, and the red-footed booby sometimes visit the Florida coast.

GAN'YMEDE. According to a Greek myth, this beautiful youth, the son of King Tros, attracted the notice of Zeus, king of the gods, who determined to make him his cupbearer to succeed the goddess Hebe, and so sent his eagle to carry him off to heaven. Zeus gave Tros a pair of divine horses and comforted him by telling him that his son was now immortal. Ganymede was a favorite subject of ancient art.

GAR. This name is given to two unrelated families of fish—the fresh-water gar pikes of North America and the marine gar fishes. All of them are large fish and have jaws prolonged to form a lengthy beak armed with sharp teeth.

THIS GIANT ALLIGATOR GAR GREW IN MISSISSIPPI



This great alligator gar from Moon Lake, Miss., is about ten feet long. Notice the long snout with two rows of sharp teeth. These inedible fish do great damage to the commercial fishing industry.

Gar pikes are survivors of a primitive order (*Holostei*) once abundant in European waters They are now confined to Central America and North America in the Atlantic and Gulf coastal rivers the Great Lakes and rivers and lakes of the Mississippi Valley

They have slender cylindrical bodies covered with diamond shaped ganoid scales—that is scales composed of bone and an outer layer of enamel Because of this armor plate no other fish attacks them Before the days of the steel plow the horny skin was used to cover plow shares It is still used to a small extent as a covering for novelty boxes Gars are seldom used for food Fishermen kill them because they are highly destructive to other fishes They are solitary feeders Drifting near the surface of the water they look like a piece of wood

The long nose gar or billfish (*Lepisosteus osseus*) is the most abundant It grows to be 4 or 5 feet long The short nose gar (*L platostomus*) and the spotted gar (*L productus*) are smaller usually 2 or 3 feet long The alligator gar (*L spatula*) is one of the largest fresh water fish in North America Because of its great size (6 to 10 feet long) it causes considerable damage to fishing nets and gear

The marine gars (also called needlefishes) are from 4 to 6 feet long They are greenish fishes with silver scales They are edible but are unpopular as food fishes because the bones even when cooked are a bright green These gars are plentiful along sandy shores of the Atlantic and Gulf coasts where they feed in large shoals on other fish Silver gars (*Strongylura marina*) are found from Cape Cod to Texas

GARDENIA The shrubs and trees known as gardenias are prized for their fragrant waxlike flowers of white or yellow The sixty or more species are all native to warm parts of the Old World notably China India and South Africa Long ago several species were introduced into Europe and America

The most widely cultivated species is the Cape jasmine not to be confused with the true jasmine (*see* Jasmine) It is native to China but it was introduced into Cape Colony and from there brought to England and the United States

The tender shrubs two to six feet high thrive outdoors as far north as Virginia They wear pointed evergreen leaves up to four inches long and burst into flower from May to September breathing out a sweet and heavy fragrance The overlapping petals of waxy white form a dish-shaped blossom of delicate beauty The blossoms range in size from two inches for the garden varieties to four inches for those cultivated in greenhouses

The greenhouse varieties are propagated from cuttings planted in early winter and kept over heat To insure large and luxuriant blooms the buds and the side shoots are pinched off until late September Buds are then allowed to set upon the stronger shoots They bloom by early winter in time to meet the seasonal demand for cut flowers

Gardenias form the genus *Gardenia* of the madder family (*Rubiaceae*) *The scientific name* of the Cape jasmine is *Gardenia jasminoides* The genus *Gardenia* was named for Dr Alexander Garden (1730? 1791) of Charleston, S C who first described it

FRAGRANT BEAUTIES OF THE SOUTH



The heavy petalled waxy white gardenias grow in the warm regions of the South as far north as Virginia They are often planted as hedges Another name for them is Cape jasmine

The ART *of* GARDENING



The gay spread of flowers, the green grass, the well-placed shrubs and small trees turn a simple cottage on a vacant lot into a beautiful home of which any man might well be proud

GARDENS AND GARDENING As widespread as the soil itself is the urge to plant a garden and watch it grow. It is an urge shared by all mankind—savage and civilized, ancient and modern, poor and rich. Even the farmer who cultivates wide acres for a living will often take special pride in the patch of vegetables, the flower beds, the shrubs, and the hedges that surround his home.

For those who live in cities and suburbs, home gardening has a very practical side. The backyard patch can be made to produce vegetables of a quality and flavor far superior to those bought at the market. A plot 20 feet square and a cash expenditure of $5 for seed and fertilizer will yield fresh vegetables approximating a value of $50. On the other hand, a flourishing flower garden and artistically landscaped home grounds may greatly increase the value of the amateur gardener's property.

But the rewards of home gardening are much bigger than mere dollars and cents As one garden-lover says, "Your chief joy in your garden will not be in the vegetables that you eat, or in the flowers that you pick, but in the satisfaction of causing things to grow. You will enjoy the companionship of things that are real and clean. You will come to know the common and the little things. Just to have handled the new earth, and to have sown the seed, and to have thought about the garden at morning and at night—this is worth the effort. You have come nearer to nature"

Selecting the Vegetables to Plant

The home gardener who is raising crops to be harvested within a few feet of his own door can overlook the requirements of the truck gardener, who has to select varieties that are easy to handle, transport, and store, and hence sacrifices delicacy of flavor to toughness of fiber. The small gardener should choose his crops on this basis· (1) relative popularity of the vegetables; (2) ease of culture, (3) returns for space and labor, (4) table usefulness and food value of the crop Bush beans, corn, peas, tomatoes, lettuce, onions, radishes, beets, and carrots are the most important vegetables suitable for the small garden

Whether we are planning to build a vegetable or flower garden or to landscape the surroundings of the home, the initial steps in garden making are the same The ideal garden plot is one that is open to sunlight but protected from drying and cold winds Where possible a general slope to the south is beneficial. No green plants can live without sunlight, and with few

tions they demand actual sunlight for at least
of the day Avoid placing the garden where it
e continually shaded by buildings
e soil is the foundation of the garden On the
of whether they are easy or difficult to work
are roughly classed as light or heavy Light soils
in a large percentage of coarse-grained sand and
herefore loose and easily worked Clay is hard
ork because it is very fine grained and holds
amounts of water Such a soil can be improved
e addition of sand and decayed vegetable matter

How to Prepare the Ground

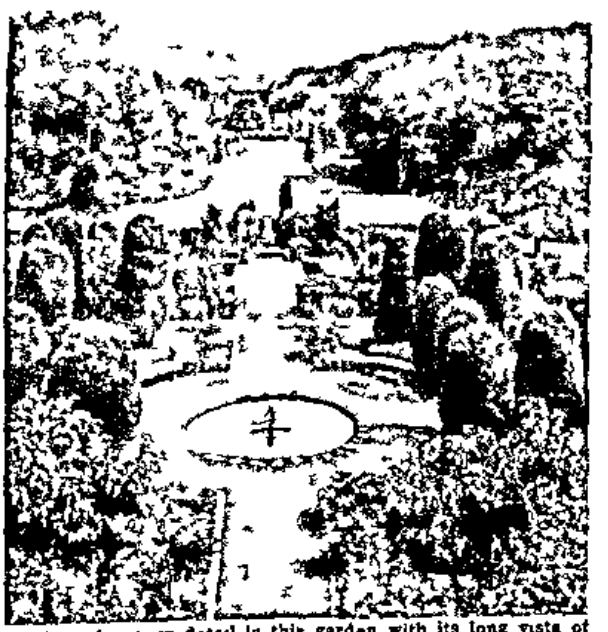
fore planting the soil must be well spaded or
ed so that the plant roots may penetrate easily
so that water and air may pass through This
be done either in the fall or in the early spring
the winter s snow and frost have disappeared
the ground is dry enough to crumble when it is
ed Among the advantages of fall plowing are the
wing (1) It gives the turned under vegetable
er a longer time to decay (2) It makes it possible
is to start our gardens earlier in the spring (3)
vy soils are made more friable by being exposed
eezing and thawing The small garden plot should
paded and pulverized
depth of two feet or
This deep tillage of
seed bed aerates the
and lessens the need
constant watering
after the soil has
raked and made
th and level are we
y to start planting
lessness in preparing
seed bed is one of the
st common causes of
den failures

Plants like children
uire a well balanced
ion of food in order to
ive The soil is their
board and this must
well stocked to produce
best crops There are
ee elements in the soil
cessary for plant growth
at often need to be in
ased These are nitro-
n phosphorus and po-
sium The materials we
e to supply these ele-
ents are called fertilizers
rnyard manure supplies
ese foods and also adds humus or organic matter
he latter makes the soil light and loose so that the
ant roots may penetrate easily and also helps
tain the water in the soil

Standard commercial fertilizers containing about 4
r cent nitrogen 12 per cent phosphorus and 4 or 5
per cent potassium may be substituted if barnyard manure is not available using about one pound of fertilizer for every 30 square feet of land If commercial fertilizers are used as much vegetable matter as possible should be added to the garden soil every year to maintain the supply of humus Rye planted in the fall after the crops are harvested and plowed under in the spring will supply this vegetable matter Lime is added to correct the acidity of the soil but gardens should not be limed unless tests show that it is needed If beets grow well in the garden lime is probably not needed Lime is also added to improve the physical character of some heavy soils such as clay In this instance about 30 bushels to the acre are used (*See* Fertilizers Soil)

It is good practise to make a rough plan of your garden on paper before planting In arranging the different crops in the seed bed the following hints should be considered (1) Perennials that is plants that live on and continue to produce flowers fruits and seeds from year to year should be placed to one side so that they will not interfere with the yearly plowing and cultivation of the seed bed (2) Spreading plants including melons cucumbers squashes pumpkins and tomatoes should not be permitted to over run smaller crops (3) Tall plants should not over shadow shorter ones

A FORMAL TREE FRAMED PICTURE



Patric an in every detail is this garden with its long vista of gravel walk marble benches sun d al and circular pool closed in by sculptured greenery

When to Plant

There are two important planting times spring and fall Annual vegetable and flowering plants—those that bloom and produce fruits and seeds in a single season—are usually planted in the spring but almost any annual which is self sowing can be seeded in the fall Annual flowers especially poppies corn flowers larkspur and even sweet peas will bloom much earlier if planted in the fall Plants that are propagated by means of bulbs such as daffodil narcissi tulips and others are planted in the fall if they are to bloom during the following spring February and March are the months in which to plant early flowers and vegetable seeds indoors or in hot beds or cold frames Tomato seeds should be planted from eight to ten weeks before the plants are to be placed in the garden and pepper and early cabbage seeds from six to eight weeks Petunia verbena, pentstemon lobelia snapdragon and other flower seeds

that require a long time to germinate should be planted before the end of February.

For indoor planting a warm room and a sunny window with preferably a south or east exposure are required. A shallow wooden box or tin pan with holes punched in the bottom for drainage will serve as a temporary home for the plants. The box or pan should be filled to a depth of about four inches with good garden soil. Starting plants in hotbeds or cold-frames, if these are available, is preferable to indoor planting. Not only can a greater number of plants be sown, but such quickly maturing crops as lettuce and radishes may be raised.

How to Transplant

Before the seedlings are transplanted to the garden they should be kept outdoors for a few days so that they will become accustomed to their new environment. The chief rules for transplanting are: (1) Select a cloudy day. (2) Give the seedlings a thorough watering before moving them. (3) Take up each plant carefully so that its roots will be disturbed as little as possible, and place it in the hole made with a small stick or dibble. (4) Plant the seedling slightly deeper than it grew before and press the soil firmly about its roots. (5) Water each plant thoroughly immediately after transplanting.

TULIPS AGAINST A VINE-CLAD WALL



The "outdoor living-room" gains privacy if enclosed by a wall rather than a hedge. Here the tulip-bordered stone walk is set off effectively against the vine-draped garden wall.

The natural time for any kind of transplanting is in the spring because then the plants are starting new growth and their active cell formation will repair damages to the roots. Transplanting trees, shrubs, and other perennial plants in the fall, however, is practical except in very cold or dry regions. In moving a plant always remember that it is a living thing and that cutting or breaking its roots may kill it. Evergreens and most other trees and shrubs should be handled with a large ball of earth around the roots to protect them. The hole into which the new plant is to fit should be made much deeper and wider than is necessary to accommodate the plant, and the bottom should be covered with fertile top soil. Spread the roots into their natural positions, and then gradually work in rich and well pulverized soil about the plant and roots. Put in small quantities at a time and press each layer in firmly. In dry weather particularly, and always with plants having big roots, it is better to wash the soil into position with copious waterings from a hose. Fertilizer must never come in contact with the roots, so do not mix it with the soil used in transplanting.

"Plant thick and thin quick" is the colloquial expression of good garden practise. Plant vegetable and flower seeds thickly enough to give the garden the appearance of being well covered. As the plants develop, never permit them to crowd one another. Pick out the superfluous plants so that each remaining individual will have plenty of room for full development. Consult the vegetable and flower charts at the end of this article for directions concerning the depth to plant various seeds, and the distance that should be left between different plants.

Annuals will give the quickest returns in the flower beds and are essential for carrying color and bloom in the garden in midsummer. But among the earliest and finest flowering plants are the hardy perennials, the permanent plants which should be a part of every garden. There are two general types of perennials: perennial shrubs with woody tree-like stems such as roses, and herb-like or herbaceous perennials in which the soft pliant foliage springs directly from the roots. In the latter the stems and leaves are killed by frost each fall and are replaced by new growths each spring.

Herbaceous perennials are planted in the garden wherever they give the most pleasing effects. They may be planted with shrubs or intermingled with annuals in the flower bed. They are used very effectively to furnish a border fringing the side of the lawn or even surrounding it. Peony, iris, phlox, hardy chrysanthemum, aster, campanula, delphinium, day lily, lupine, gaillardia, and plantain lily are a few of the many reliable perennials that may be used in the herbaceous border.

Spring flowering shrubs, many of which also bear attractive fruit in the fall, will help to furnish the permanent garden. Plant these preferably in the background with the flower borders in front.

Landscaping the Home Grounds

The first step in beautifying the home grounds with flowers, shrubs, and trees is to work out a complete and detailed plan. To buy shrubs and flowers before working out a planting scheme would be just as foolish

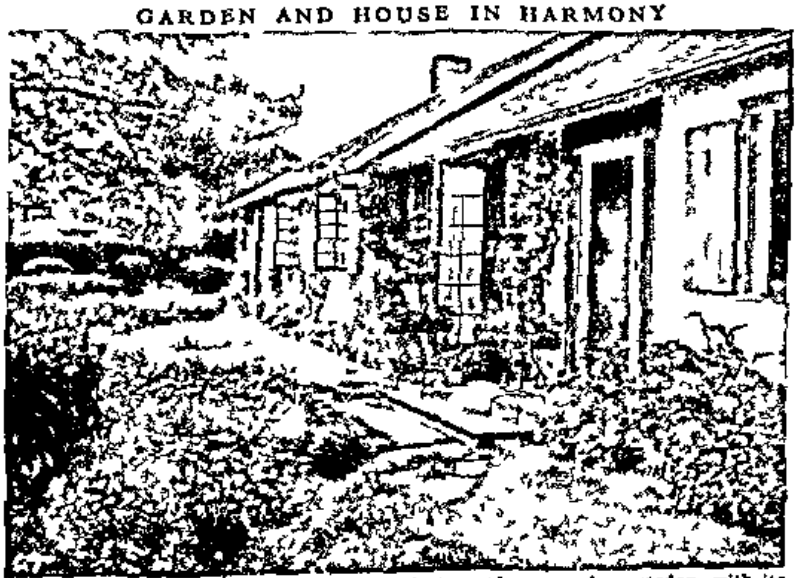
as attempting to build a house by shopping for doors, windows, and lumber before drawing plans for the building The purpose of home landscaping is to create a harmonious and beautiful setting for the house itself Trees and shrubs should not hide the house, rather they should bring out its salient features and harmonize with its architecture Not only in our plant arrangements should we strive for harmony, but also in our color schemes

Fitting the Garden to the House

In relating the garden to the home there are three areas to consider the front, the service and the pleasure area, or "pleasance" The front and back lawns serve as the groundwork of the garden picture It is generally preferable not to cut up the center of the lawn to make room for flower beds or other ornamental planting A well kept lawn is beautiful in itself No matter how fine its architecture the house is not complete without some carefully placed plant masses around its foundation to blend it with the landscape Low growing shrubs should be planted in front of porches and under windows Taller growing shrubs will give support to each end of the structure

The service area in the back yard should be convenient to the service quarters of the house and preferably screened off by shrubs or other plants to add to the garden picture The pleasure area should be designed in relation to the living quarters of the home Draw imaginary vista lines from windows, doors, and porches to the most distant points of the available garden area, and keep these vistas free and open Draw a rough plan of the area with the vista lines marked on it and showing any other permanent features, such as garage or stable Also lay out any necessary walks Roughly draw ovals in each of the more or less rectangular spaces thus formed This will give you a working foundation for the plantings The centers of these ovals should be kept unplanted or practically clear. Paths should be straight wherever possible The serpentine path is an irritation, but if introduced, each bend should be justified by some interfering object, such as a tree or a flower bed Since the garden and dwelling form a picture, modern taste justifies a permanent enclosure so as to give scale to the entire composition This enclosure may be a wall or hedge

GARDEN AND HOUSE IN HARMONY



This small simple cottage calls for just this type of surrounding garden, with its flagstone walks, its border of perennials its low flowering shrubs and the climbing roses of its walls Modest informality and a spirit of care free ease give the scene its charm

The most common hedge material is privet, but arborvitae, white pine, spruce, lilac, or other shrubs that can stand shearing are equally suitable Hedges should be planted in a deep trench well supplied with fertilizer Each shrub should be planted deep enough so that the final branching will extend right down to the ground level Hedges are pruned slightly wider at the base than at the top so as to avoid snow damage The last pruning should be given about six or eight weeks before frost is expected (*See* Hedges)

Preparing a Good Lawn

The best lawn grass is Kentucky blue grass, but it is safer for the average lawn maker to use a high quality lawn seed mixture as put up by established seed dealers Such mixtures are more than 50 per cent blue grass, with other grasses that will germinate more quickly and give a green appearance to the lawn soon after seeding The best time to seed a lawn is in late summer or early fall but it is commonly done in the spring The soil of the lawn area needs the same preparation as the soil of the garden itself When turning the soil, add commercial fertilizer in the proportion of ten pounds to a thousand square feet Sow three to five bushels of seed to the acre, for small areas four pounds to every thousand square feet Roll the ground lightly after seeding

Rockeries, pools, bird baths, sun dials, and other special garden features must be introduced with care A combination pool and rockery usually works out well A rock garden should not be a mere pile of rocks adorned with a few flowers, but instead it should be a close imitation of a natural rock outcrop carefully planted with an interesting collection of rock plants It is best placed at one corner of the garden in a realistic setting Use old weathered rocks, all of one kind The stones should be laid horizontally, not like spiked turrets projecting into the air In building a rockery, make a mound of earth and then place the rocks in position on the mound, burying about two thirds of the stone in the soil Each rock should be used as a support for the soil, and should be slightly tilted so that the water will drain backwards to the

FAVORITE BIENNIALS AND PERENNIALS EASY TO RAISE FROM SEED

These are best sown in early fall when they will flower the next year; but spring sowing is satisfactory for many of them. Make a seed-bed by forking up the soil at least one foot deep; level, smooth, and scatter seeds lightly on top. Water the bed the day before sowing. Sow in a cold-frame, if possible, and shelter it from the noonday sun. If sown in the open, shade with paper until germination takes place. Transplant, that is, "prick out," when seedlings make first pair of true leaves.

Name of Flower	Height, in Inches	Color of Flower	Distance Apart, in Inches		Depth to Sow (in.)	Month of First Flowering	Weeks in Bloom
			Pricking Out	Permanent Planting			
Achillea filipendulina (fernleaf yarrow)	36–42	yellow	2	15	1–16	July and Aug.	4–6
Achillea millefolium (common yarrow or milfoil)	18–24	white, pink	2	12	1–16	July and Aug.	6–8
Achillea ptarmica (the pearl or sneezewort)	18–24	white	2	12	1–16	July	all summer
Aconitum napellus (aconite or monkshood)	48	dark blue	4	18–24	1–4	July and Aug.	4–6
Althaea rosea (hollyhock)	48–54	white, rose, yellow, purple	4	18–24	1–2	August	
Anemone japonica (Japanese anemone)	24	white, pink	3	18	1–4	August	6–8
Anthemis tinctoria (golden marguerite)	18–24	yellow	2	12	1–16	July	4–6
Aquilegia spp. (columbine)	18–34	white, yellow, blue	3	9–12	1–16	May and June	8–10
Arabis alpina (rockcress)	6	white	3	6	1–4	May to Sept.	4–8
Asclepias incarnata (swamp milkweed)	36	rose	4	18	1–4	July	4
Asperula odorata (woodruff)	12	white	2	8	1–16	June	8–10
Aster alpinus (hardy aster)	18–36	blue	3	18	1–4	September	8–10
Bellis perennis (daisy)	6–8	white, rose, streaked	3	8–10	1–4	Easter	8–10
Bocconia cordata (plume poppy)	36	white	2	24	1–4	July	4–8
Campanula spp. (bellflower or harebell)	6–36	blue, white	3	15–18	1–4	May	8–12
Centaurea spp. (cornflower or sweet sultan)	18–24	yellow, white, purple	4	6–12	1–4	May	4–8
Coreopsis grandiflora (perennial tickseed)	24–36	yellow	3	12	1–4	June	8–12
Delphinium spp. (larkspur)	18–36	blue, scarlet	4	18–24	1–2	June and July	12–16
Dianthus barbatus (sweet-william)	12–18	blue, pink	3	12–18	1–4	June	6–8
Dictamnus fraxinella (gas plant)	24	red, white	3	18	1–4	June	4–6
Digitalis purpurea (foxglove)	24–36	purple, rose, white	4	15–18	1–4	June	4–6
Eryngium giganteum (sea holly)	24	blue	3	18	1–2	June	6–8
Eschscholtzia californica (California poppy)	8	white, pink, brilliant orange	2	8–12	1–16	June	all summer
Gaillardia aristata (blanket-flower)	18–24	yellow	3	15–18	1–4	June	8–10
Gypsophila paniculata (baby's breath)	18–24	white	3	15	1–4	July	8–10
Heuchera sanguinea (alum root; coral bell)	15–24	crimson, rose	3	15	1–4	June	6–8
Iberis sempervirens (candytuft)	9–12	white	2–3	9–12	1–4	May	8–10
Lobelia cardinalis (cardinal flower)	48	carmine	3	15–18	1–4	July	4
Lupinus polyphyllus (lupine)	48	blue, delicate white	4	24–30	1–2	June	6–8

FAVORITE BIENNIALS AND PERENNIALS—Continued

Name of Flower	Height in Inches	Color of Flower	Distance Apart in Inches		Depth to Sow (in)	Month of First Flowering	Weeks in Bloom
			Pricking Out	Permanent Planting			
Lychnis chalcedonica (Jerusalem cross)	36–48	scarlet	3	12	1–4	June	4–6
Lychnis coronaria (mullein pink rose campion)	24	rose	3	12–18	1–4	June	4–6
Myosotis spp (forget-me-not)	10–12	blue white	3	10–12	1–4	April	all summer
Oenothera biennis (evening primrose)	36–42	yellow	2	18	1/8	July	6–8
Papaver nudicaule (Iceland poppy)	9–24	yellow pink scarlet	2–4	6–12	1/16	April May	4–8
Papaver orientale (oriental poppy)	9–24	bright crimson	2–4	8–12	1/16	May	4/8
Papaver rhoeas (Shirley poppy)	24–36	red	2–4	12	1/16	May	4–8
Pentstemon barbatus (beard tongue)	36–42	pink to red	2	15	1/16	July	4–6
Petunia spp	12–24	white purple rose pink	6	8–12	1–4	June July	all summer
Phlox drummondi (phlox)	6–12	white yellow pink lilac purple crimson	6	8–12	1/8	May	4–6
Platycodon grandiflorum (balloon flower)	18	blue white	3	12	1–4	June	4/6
Primula polyanthus (gold laced polyanthus)	8–10	creamy white to maroon	2	6–8	1/16	May	8–10
Primula vulgaris (primrose)	6/8	yellow	2	6–8	1/16	April	6
Pyrethrum spp (painted daisy)	18	white pink	3	12	1–4	June	6–8
Stokesia cyanea (Stokes aster)	12	blue	5	15	1/4	May	24
Viola tricolor (pansy)	8–10	blue yellow white mottled	4	10–12	1–4	March and after	8–10

roots of the plants If a pool is used in combination with a rock garden it should be informal The concrete work should be carefully concealed with grasses and plants The margins of the pool should be irregular and just as natural in appearance as possible Iris marsh marigolds rockcress dwarf speedwell pyrethrum columbine and other plants adapted to a moist soil may be planted along the margins and in the pool itself water lilies and other water plants

Trellises arbors and pergolas lend interest to the garden but these should always be draped with some kind of vine climbing rose or other trailing plant

Weeds and Insect Pests

Once the garden is planted weeds various insect pests and fungus diseases demand attention Stirring the surface soil with a hoe throughout the growing season will keep down the weeds—those robber plants that steal the food and water from flowers and vegetables The soil should be cultivated only to the depth necessary to destroy the weeds as deeper cultivation is likely to injure the roots of the plants

Our battle with insect pests and fungus diseases should begin before these enemies swoop down on the garden Fungus diseases such as mildews and rusts, are controlled by sprays containing salts of copper of which Bordeaux mixture is the best known On the basis of their feeding habits insect pests are classed as chewing sucking or boring insects The chewing kinds caterpillars beetles and other insects that eat the foliage must be killed by a stomach poison arsenate of lead or paris green for example The sucking insects (plant lice or aphids, leafhoppers and the like) which pump the juices out of the plant tissues must be smothered by oils or dusts or killed with paralyzing contact poisons such as nicotine The borers tunnel through the branches and roots of trees shrubs and other plants and must be hooked out with a wire Burning the refuse and stubble in the field will help rout the corn borer (*See* Spraying) We should remember that not all insects are pests Bees butterflies moths and many others play their useful part in the pollination of flowers Others assist in the war against harmful insect pests by preying on these varieties (*See* Insects)

Watering and Protecting the Garden

In order to thrive the garden needs frequent watering throughout the growing season Usually a thorough watering once a week, moistening the soil to a depth

of at least four inches, is sufficient. Merely sprinkling the surface of the garden soil is worse than not watering the garden at all, for it causes the plant roots to reach for the water and come to the surface.

Winter protection of the trees, shrubs, and perennial plants of the garden must not be neglected. A mulch of hay or straw over the perennial plants after the ground has been frozen will protect them. Partly rotted manure, burlap, hay, straw or even ashes may be spread around trees and shrubs. The main purposes of a winter mulch are to prevent damage to the plant roots from alternate freezing and thawing, and to reduce evaporation of the moisture from the soil.

Some Practical Selections

Among the multitudes of flowers grown in gardens a few only have withstood the test of time. The unskilled gardener should not experiment with untried novelties. Annuals are most easily grown, but should be chosen definitely to fit the purpose. Most perennial flowers will thrive on moist soils, and should be selected carefully for the place they are to occupy as they improve year by year until crowded, when they must be taken up, divided into smaller pieces and replanted as at first.

Ten annuals useful as cut flowers: Sweet alyssum, China aster, baby's breath, coreopsis, Swan River daisy, nasturtium, pansy, sweet pea, Chinese pink, ten-weeks stock.

Six fragrant-flowered annuals: Bartonia, mignonette, sweet pea, ten-weeks stock, sweet sultan, sweet alyssum.

Six climbing annuals: Balloon vine, hyacinth bean, cypress vine, Japanese hop, moon-flower, morning glory.

Six annuals for sunny places: Love-lies-bleeding, balsam, hyacinth bean, gaillardia, nasturtium, rose moss.

Six annuals for shady places: Godetia, musk, nemophila, pansy, tarweed, wishbone flower.

Six annuals for rocky places: Annual phlox, candytuft, catchfly, clarkia, nasturtium (dwarf), rose moss.

Six annuals for sandy soils. Clarkia, poppy, godetia, nasturtium (dwarf and tall), rose moss, zinnia.

Six annuals for heavy soils: Annual chrysanthemum, godetia, sweet pea, petunia, sweet alyssum, pot marigold.

Six annuals that bloom after frost: Sweet alyssum, candytuft, cornflower, marigold, annual phlox, ten-weeks stock.

Tall perennials: Hollyhock, plume poppy, golden glow, double perennial sunflower, sneezeweed, late sunflower, Maximilian's sunflower.

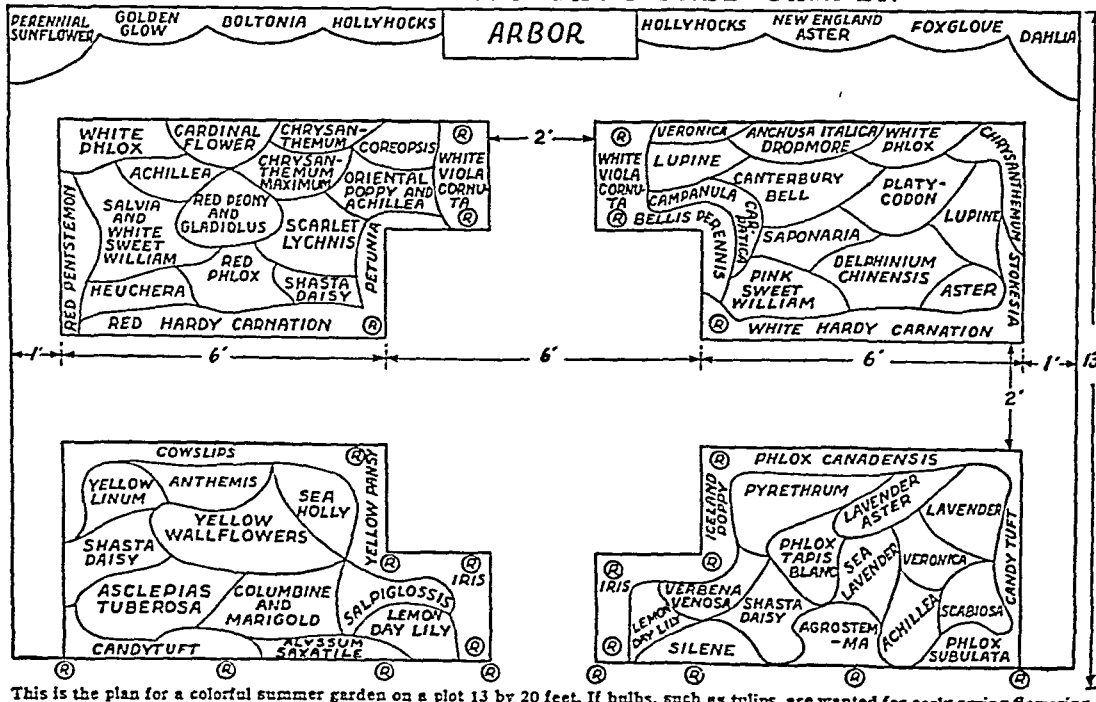
Medium height perennials: Common columbine, bleeding heart, European peony, sweet-william, Chinese peony, foxglove, oriental larkspur, peach-leaved bellflower, oriental poppy, perennial gaillardia, Japanese iris, balloon-flower, beebalm, swamp rose mallow, late perennial phlox, Japanese anemone, subsessile veronica, hardy chrysanthemums.

Low-growing perennials: Japanese adonis, crested dwarf iris, dwarf flag, golden tuft, moss pink, English daisy, white rockcress, Geneva bugle, tufted pansies or violas, snow-in-summer, woolly yarrow, Canada anemone, Carpathian harebell, coral bells, purple poppy mallow, hardy leadwort, smoothish fleabane, Napoleon III pink.

Perennials with fragrant flowers: Winter heliotrope, California and Russian violets, white rockcress, woodruff, lily-of-the-valley, peonies, gas plant, valerian, lemon lily, dwarf orange day lily, Scotch grass pink, fringed pink, sweet rocket, beebalm, entire-leaved bush clematis, August lemon lily, white day lily.

Perennials for cut flowers: Christmas rose, California and Russian violets, foxglove, oriental larkspur, everblooming ragged robin, pearl achillea, Japanese iris, Miss Lingard phlox, Japanese anemone.

PLANTING AN OLD-FASHIONED GARDEN



This is the plan for a colorful summer garden on a plot 13 by 20 feet. If bulbs, such as tulips, are wanted for early spring flowering, they must be put into the ground the previous fall. Roses are to be planted at points marked "R."

WHAT AND WHEN TO PLANT IN THE VEGETABLE GARDEN *

The dates of planting shown in this table are approximate for the United States and will vary with the season The dividing line between North and South is considered to be the continuation of the southern boundary of Pennsylvania or about the 40th parallel of latitude Unless you have a large plot do not attempt to grow all the vegetables in this table Usually the small home gardener will find it more advisable to buy plants of such vegetables as asparagus (preferably 1 year-old roots), cabbage, cauliflower, celery, eggplant, pepper, tomato, etc , than to grow them himself

Kind of Vegetable	Seeds or Plants Required for 100 Feet of Row	Time of Planting out of Doors (N = North S = South)	Distance between Plants	Depth of Planting	Time Required to Secure Crop after Planting
Asparagus	60 to 80 plants	Early spring	2 ft	5 to 6 in	1 to 3 yr
Beans bush (kidney and lima)	1 qt	N— April to July S— Feb to Apr (Aug)	2 to 4 in	1 to 2 in	40 to 65 da.
Beans pole (kidney and lima)	4 oz	May and June	15 to 24 in	1 to 2 in	50 to 80 da
Beets	1 oz	Early spring	4 to 6 in	½ in	60 to 75 da
Brussels sprouts	½ oz	N— May to June S— Jan to July	1½ to 2½ ft	½ in	100 to 125 da.
Cabbage early	½ oz	N—Mar–April (start in hotbed Feb) S— Oct to Dec	14 to 18 in	½ in	110 da from plants
Cabbage late	½ oz	N— May and June S— June and July	18 to 24 in	½ in	150 da from plants
Carrots	1 oz	Early spring May 15 to June 15	3 to 6 in	¼ to ½ in	80 to 110 da.
Cauliflower	½ oz	May 15–June 15 (hotbed in March)	1½ ft	½ in	100 to 130 da.
Celery	½ oz	May for early crop (start under glass in Mar or April) July for late crop (sow seed in May)	4 to 8 in	½ in	160 to 170 da from seed 90 to 100 da from plants
Chard (Swiss)	½ oz	Early spring to June 15	4 to 6 in	½ in	To middle of summer
Corn sweet	½ to 3 oz	Early spring	12 to 18 in	½ to 1 in	60 to 100 da.
Cucumber	½ oz	N— May to June S— Mar to April	4 to 5 ft.	½ to 2 in	60 to 80 da
Eggplant	½ oz	N— June S— Jan to May	2 to 3 ft	½ to 1 in	120 to 150 da.
Kohlrabi	½ oz	N— April to June S— Sept to Mar	6 to 8 in	½ in	75 to 120 da
Lettuce	½ to 1 oz	N— April to Aug S— Oct to Mar	12 in	¼ to ½ in	60 to 90 da.
Melon muskmelon	½ oz	N— May 15 to June 15 (sow seed under glass April 15 S— Feb	4 ft	1 to 2 in	110 to 130 da.
Melon, watermelon	1 oz	N— May 15 to June 15 S— Mar to May	7 to 10 ft	½ to 1 in.	115 da
Okra, or gumbo	1½ to 2 oz	N— May to June S— Feb to April	14 to 36 in	1 to 2 in	115 da
Onion seed	½ oz.	N— April and May S— Oct to Mar	2 to 4 in	½ in	135 da
Onion, sets	1 to 1½ qt	N— Early spring S— Fall and Feb	2 to 4 in	½ in	60 da
Parsley	½ oz	N— Last of Mar to 1st of April S— Sept to May	3 to 6 in	½ in	95 to 120 da
Parsnips	½ oz	April and May	3 to 4 in	½ in	125 to 160 da.
Peas	1 qt	N— Early spring S— Dec to April	10 to 15 in	1 to 2 in	60 to 80 da.
Pepper	½ oz	N— May and June (start early plants under glass in Mar) S— Last of Mar	18 to 24 in.	½ to 1 in	100 to 140 da.
Potato sweet	3 lb (or 75 slips)	May and June (start in hotbed in April)	14 to 18 in	3 in	140 to 160 da
Potato white	5 to 8 lb tubers	N— Mar to June S— Jan to April	12 to 18 in	4 in	80 to 140 da
Pumpkin	1 oz	N— May to June S— April and May	2 plants in hill 8 to 10 ft	1 to 2 in	110 to 140 da
Radish	1 oz	N— *Mar to Aug* S— Sept to April	*1 to 2 in*	½ in.	*30 to 40 da*
Rhubarb	25 to 50 roots	N— Early spring S— Fall	2 to 4 ft	2 to 3 in	1 to 3 yr
Rutabaga	½ to 1 oz	N— June to July S— Aug to Sept.	8 in	½ to ¾ in	70 to 100 da.
Salsify	1 oz	Early spring	3 in	½ to 1 in	130 to 160 da.
Spinach	1 oz	N— April 1 to Sept 15 S— Aug to Oct.	6 to 8 in.	½ in.	50 to 60 da.
Squash bush or early	1 oz	N— May S— Feb to Mar	3½ to 4 ft	1 in.	60 to 75 da.
Squash late	1 oz	N— May S— Feb to Mar	6 to 10 ft.	1 in	125 to 150 da.
Tomato	½ oz	N— May to June S— Jan	2½ to 4 ft	½ in	130 to 150 da.
Turnip	½ to 1 oz	Early spring	2½ to 6 in	½ to ¾ in	40 to 60 da

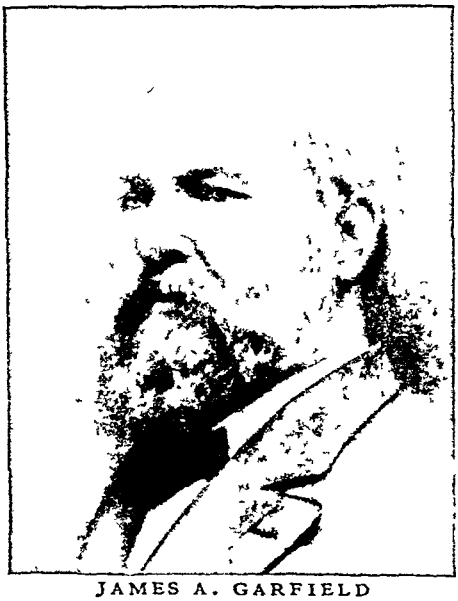
*Reprinted by courtesy of International Correspondence Schools, Scranton, Pa.

Copyright 1917, by International Textbook Co

AMERICA'S *Second* MARTYRED PRESIDENT

GARFIELD, JAMES ABRAM (1831–1881). When Garfield was assassinated on July 2, 1881, many comparisons were made between his life and that of Abraham Lincoln, the first "martyred president." Both were "self-made men." Both were born in log cabins, and endured in youth the privations which accompany farm life on the frontier—Lincoln in Illinois, Garfield in Ohio. As a young man, Lincoln took a flatboat down the Mississippi River; Garfield at about the same age served on a canalboat on the Ohio and Pennsylvania Canal. Both were eager for an education: but while Lincoln attained his knowledge by studying at night alone, Garfield was able by hard work to obtain a college education.

Garfield was born of poor parents in Cuyahoga County, Ohio, a few miles southeast of the present city of Cleveland. His father was a farmer. From an early age the future 20th president was a tireless reader. One of the many books he read and reread beside the flickering flame of the wood fire in the log cabin was a book of sea stories. These so caught his youthful fancy that he resolved to become a sailor. At 17, with his mother's consent, he tramped across the country to Cleveland and tried to ship on a lake boat.



JAMES A. GARFIELD

The captain drove him from the deck, and the disappointed lad had to content himself with a job on a canalboat, driving the mules along the towpath and acting as deck hand. A lucky attack of sickness sent him home, and his ambitions were turned to higher fields. By the time he recovered, his mind had been set on becoming a teacher, and he started off to school with a slender capital borrowed from his widowed mother. After his first term he needed no more help from her, for he worked his way through the Western Reserve Eclectic Institute at Hiram, Ohio (now known as Hiram College), by farm labor and carpentering. When he was ready to enter college his choice fell on Williams College, because its president was the celebrated Mark Hopkins, for whom Garfield had the greatest admiration. Garfield used to say, "A log with a student at one end and Mark Hopkins at the other is my ideal college." He was graduated from Williams in 1856.

Garfield as a College President

When, at the age of 26, Garfield became president of the Ohio college where he had taken his preliminary work, he proved himself a teacher of the same type as Mark Hopkins—a man of unbounded zest for truth, limitless curiosity, and intense interest in his pupils. Had he remained in this work, he would doubtless have become one of the country's great educators. It is interesting to know that his four sons also went to Williams College, and one of them, Harry Augustus, became its president. This son served during the first World War in the post of fuel controller. The second son, James Rudolph, was secretary of the interior under President Theodore Roosevelt. The third, Irvin McDowell, attained eminence as a lawyer, and the fourth, Abram, as an architect.

Garfield's rise was rapid. Within six years after his graduation he had been president of Hiram College, Ohio state senator, major general in the United States Army, and representative-elect to the United States Congress. A more rapid rise than this has been made by no American statesman, and the variety of the positions shows that he himself practised his advice to young men, to "be fit for more than the one thing you are now doing."

Service in Civil War

While teaching at Hiram College, Garfield studied law; and from the time of his admittance to the bar, in 1859, until his death, he was continually engaged in politics, with the exception of the two years that he served as an officer in the Union Army during the Civil War.

Though he was a brave soldier and an able officer, and in 1863 was commissioned major general for his courage and resourcefulness at the battle of Chickamauga, President Lincoln thought Garfield would be of greater use to his country in Congress. So he resigned his commission, in December 1863, and took the seat in the House of Representatives to which he had been elected the year before. There he made himself especially useful in the committees on military affairs and on finance. He served for 17 years in the House—until his election in 1880 to the Senate from Ohio; and it has been said that his speeches in Congress give a connected history of the times. Garfield was an impressive orator, because he had a powerful voice, great personal magnetism, and a straightforward style of address which aroused enthusiasm and carried conviction.

The triumph of his political career came when he unexpectedly received the Republican nomination for the presidency in 1880. The party was divided that year into two factions—the "stalwarts," who wished Grant to be nominated for a third term, and the

"half breeds" who opposed Grant and for the most part favored James G Blaine Neither side would yield, and after a long fight they compromised on James A. Garfield, a "dark horse Because Garfield was a "half-breed," Chester A Arthur an uncompromising "stalwart," was made the candidate for the vice-presidency

His Personal Appeal to the People

In the campaign which followed Garfield spoke in his own behalf, the first time that a presidential candidate had thus appeared before the people He won an impressive victory with a total of 214 electoral votes to 155 given to General Hancock the Democratic candidate

Garfield never had a chance to show his ability as chief executive of the country Four months after his inauguration he was shot by Charles Guiteau a disappointed office-seeker The tragedy was the result of the bitter quarrel between the stalwarts and "half-breeds' over appointments to office a quarrel which absorbed all of the president s time before he was shot

The day of the tragedy was to have been a red letter day in the president s life He was on his way back to his beloved college, Williams from which he had been graduated 25 years before to join in the reunion of his classmates The assassin s bullet struck him down as he was walking through the railway station in Washington to his train After lingering between life and death for weeks Garfield died Sept 19 1881 He was buried in Cleveland Garfield was the second president of the United States to be assassinated and the fourth to die while in office

GARIBALDI, GIUSEPPE (1807–1882) "The third time s the charm," according to the old saying but it was the fourth attempt which brought Giuseppe Garibaldi, the knight errant of Italian unity, his signal success and enduring fame Twice he joined in vain attempts to free Italy from Austrian rule first in 1834 and again in 1848—and both times he was forced to flee from the country In 1834 he escaped to South America with a sentence of death hanging over him There he stayed for 14 years taking part in the civil wars of Brazil and Uruguay, earning for himself the title of "Hero of Montevideo" and forming the "Italian Legion" which was later to help emancipate the homeland

Returning to Italy he took part in the unsuccessful Revolution of 1848 and commanded the forces of the short-lived Roman Republic which he and Mazzini set up When this collapsed Garibaldi escaped in a wonderful retreat through central Italy pursued by the troops of four countries This time he sought refuge in New York, where he engaged for several years in trade and commerce and succeeded in accumulating a small fortune

His third opportunity came in 1859 when Sardinia-Piedmont with French aid went to war with Austria Garibaldi s Alpine infantry was victorious in the north, but further advance was checked by the peace made with the Austrians at Villafranca by the faint-hearted Napoleon III

Secretly encouraged by Cavour, the great prime minister of Piedmont, Garibaldi and his 'Thousand Red Shirts' set forth in 1860 for Sicily, on one of the greatest filibustering expeditions in history and one that eventually gave to his king Victor Emmanuel the remaining half of Italy Within a few short weeks after landing and assuming in the name of Victor Emmanuel the dictatorship of Sicily, Garibaldi had driven all the Neapolitan forces out of the island with little loss of life to his own men He had come into possession of money, arms, boats, stores of all kinds, had increased his army to some 25 000 men, and had become the idol of all Sicily, to whom the red shirt of his warriors became the proudest badge of men and women He had so completely aroused Italy that each town poured forth its young and old to join his victorious standard

He Enters Naples in Triumph

When Garibaldi crossed from Sicily to the mainland, in August 1860, his march from Reggio to Naples resembled a triumphant procession It was only necessary for Garibaldi to appear before a town for it to surrender At one place with a few hundred men back of him he ordered 12 000 Neapolitan troops to surrender, and they immediately did so for his cause was really their cause He entered Naples in the midst of enthusiastic crowds, wildly cheering and singing the national anthem from now on called the Garibaldi Hymn' In accordance with the votes of the people Garibaldi handed the kingdom of Sicily and Naples over to Victor Emmanuel, whom he acknowledged as the king of Italy

Garibaldi himself, although he was the hero of Italy, was the most difficult problem that the new government of united Italy had to face He never forgave Cavour for the cession of Nice—Garibaldi s birthplace—to France as the indispensable price of Napoleon III s aid to Italian unity Only with difficulty was he restrained from his mad plan to attack Rome which was under the rule of the pope although he knew that an attack on it would bring against the struggling kingdom of Italy the forces of both France and Austria—her friend and enemy Twice the government was forced to send troops after Garibaldi and take him prisoner, in 1862 and 1867 When finally Italian troops entered Rome in 1870, Garibaldi had no part in it for he was at that time helping the new born republic of France in its despairing struggle against Germany

When the Franco-German war was over he retired again to his island home of Caprera, where he spent the rest of his life receiving admiring visitors and attempting to stir up the people to establish a republic in Italy He was easily worked on by unscrupulous agitators who sought the overthrow of the united monarchy he had helped to establish Fortunately the plots did not succeed and Garibaldi today is regarded as the hero of Italian unity

Making GARMENTS *by the* MILLION



Mass production of clothing is possible because of two types of power-driven machines—cutting and sewing machines. The straight-knife cutting machines shown in this picture can cut through 200 to 300 layers, the number depending on the nature of the material. The roller at the extreme left travels back and forth along the table, laying cloth from the roll evenly in layers.

GARMENT INDUSTRY. Making clothes is one of the world's biggest businesses. In the United States, manufacturing garments and similar products ranks sixth among all industries in number of employees, with more than a million workers In normal years the clothing made sells for about 8 billion dollars in retail stores.

This huge industry consists of "the cutting-up and needle trades." Factory owners buy woven and knitted fabrics from textile mills. Workers in the factories cut up and sew these materials. Among the products they make are coats, suits, skirts, dresses, shirts, blouses, hats, caps, pajamas, nightgowns, underwear, gloves, belts, and scarves.

Most factories make only one or two kinds of garments. One factory may make women's dresses, another men's suits and coats, a third women's and children's underwear, and so on. As a rule a factory does not make both men's and women's garments. Some manufacturers of men's suits and coats, however, make similar garments for women as a side line.

There are three types of producers. *Manufacturers* make finished garments Their workers carry out all the processes of designing, cutting, sewing, and selling to retailers Their factories are called "inside" factories. *Jobbers* design garments and usually cut them out. They send the garments to *contractors* for sewing or for both cutting and sewing. Contractors' establishments are called "outside" factories. Contractors return finished garments to the jobbers, who sell them to retail stores.

In spite of its size, the garment industry is not streamlined. Instead of a few big firms doing most of the business, there are more than 30,000 factories Nine-tenths of these have less than 100 employees.

One reason for this situation is that a small garment factory does not require much capital. The machines used are inexpensive in comparison with the machines of most big industries. Many processes are best carried out by hand. Making clothes does not take much space. So every year many people with a little capital set up small new clothing factories.

The factories almost always remain small. Factories grow big in industries in which machine production on an assembly line is possible. This type of production means that many thousands of articles are made exactly alike. Such standardization is not possible in the garment industry because of the way people think

FIVE THOUSAND STITCHES A MINUTE



This machine sews from 4,400 to 5,000 stitches a minute The speed depends on the weight of the material and the nature of the sewing An expert hand sewer can do only 30 to 40 stitches a minute

and feel about clothing They like to be in style but they do not want to look just like everyone else They may not like a garment even if it has been designed according to the latest fashion Each new design in a coat, suit, dress hat, or even underwear is a risk to the manufacturer He cannot afford to make too many items alike So production on a small scale is usually safer and just as profitable as production on a large scale

These facts are most important in the case of women's garments They are somewhat less important in the men s wear industry They are least important in the case of *standardized garments* such as work clothes Factories therefore are smallest in the women's garment industry Those with only 20 to 50 employees are the most important group The highest percentage of larger factories is among firms making foundation garments and house dresses

Among factories that make men s and boys' clothes, those with 100 to 250 employees do the most business The highest percentage of larger factories is among those making work shirts However, a number of factories making men sand boys' suits and coats have over 1 000 employees

THIS IS ALMOST AN ASSEMBLY LINE



Factories that make standardized garments, such as heavy cotton work clothes, use assembly line methods Here in the foreground a team of four women is preparing pockets The other women in the room are sewing *other parts* The various pieces will come together at one or more points on the line for assembling final stitching and inspection

The East leads in clothing manufacture New York State makes about 45 per cent of the clothing and similar products manufactured in the United States Pennsylvania produces about *10 per cent* New Jersey and Illinois each make about 5 per cent

New York City is the chief center There are thousands of small factories between *Sixth and Eighth* Avenues from 32d to 40th Streets Some are housed in skyscrapers an l some in old loft buildings More than 300 000 people work in these factories Streets in the neighborhood are clogged with hand *trucks*, auto trucks, and automobiles loaded with supplies finished garments, and bundles of cut-out garments for contractors Delivery boys wheel racks of garments along the sidewalks, going from contractor to jobber or from factories to New York City *stores* Retail buyers from all parts of the United States come to the district to select merchandise for their home-town stores It is the nation's fashion capital

Other leading centers of the garment industry are Philadelphia Jersey City, *Chicago* Los Angeles San Francisco, Boston St Louis Cleveland Cincinnati Baltimore and Dallas The California centers are especially important in sports and casual styles for both men and women

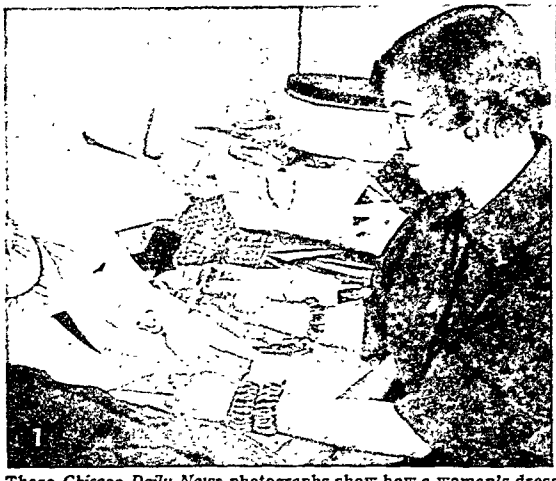
Clothing Factories in the 19th Century

The ready-made clothing industry was important in the United States by 1850 It produced close to 50 million dollars worth of clothes that year But there were no factories in the modern sense Manufacturers had garments designed and cut out in their shops and then gave them out to workers to sew at home (*See also* Clothing)

In 1846 Elias Howe invented a practical sewing machine (*see* Sewing Machine) This made possible faster sewing by less skilled workers About the same time textile factories began to turn out cheap fabrics Immigration supplied men women and children who would work for low wages The garment industry began to grow, with its workers gathered together in shops or factories instead of scattered in homes

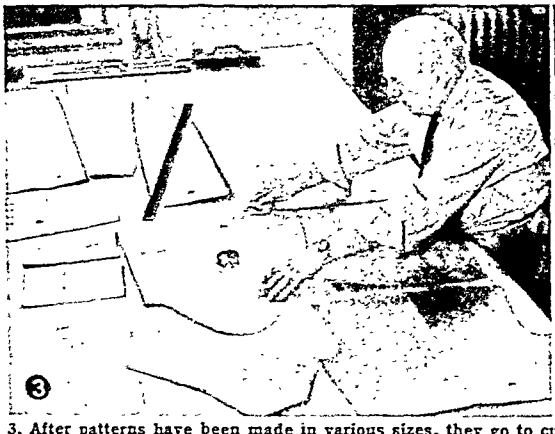
The Civil War helped the new industry develop Both the government and private manufacturers set up large shops for making uniforms Managers learned to divide the sewing into separate tasks for skilled and unskilled workers As thousands of soldiers were measured for uniforms, a definite relation between their various measurements was discovered A man with a certain chest measure usually had a certain waist measure, and so forth This discovery was the first step toward the grading of patterns in standard sizes Today this practise enables factories to make clothing that fits most people When the Civil War was

THE WORK THAT GOES INTO A READY-MADE DRESS





These *Chicago Daily News* photographs show how a woman's dress of good quality is made. 1. Designing comes first. The success or failure of a garment may depend on its design. 2. The designer chooses a material and begins to drape a sample dress.





3. After patterns have been made in various sizes, they go to cutters. These men lay patterns carefully and mark around them with chalk. They cut the most expensive dresses with shears. 4. The parts are sent to machine stitchers to be sewn together.





5. Expert finishers work at the hand-sewing table. Hand sewing is still a feature of the best quality dresses, suits, and coats. 6. After the dress has been examined and pressed, a worker drapes it, adds a belt, and adjusts the hemline.

over, many of the factories that had made uniforms turned to making civilian clothes

Power for the Growing Garment Industry

Workers operated the first sewing machines by hand pressure or with a treadle About 1865 an overhead shaft driven by a steam engine was introduced The power was taken by belts to individual machines This gave more speed to the machines with less strain on the workers Sewing machines run by electricity began to appear in 1889 By 1900 these could sew 4 000 stitches a minute A speed of about 5 000 stitches a minute is possible today There are machines and attachments for all types of sewing procedures

At first all cutting was done with shears Steam driven cutting machines appeared in the 1870 s and were replaced by electrically operated ones in the 1890 s Modern straight-knife machines cut through layers of cloth to a height of 8 inches Machines with a round rotary knife are used for lower lays

Workers in early garment factories used stove-heated flatirons A mechanical steam pressing machine was invented in 1904 Today there are electric and steam pressers of all convenient sizes and shapes In addition there are electric irons with compartments for water, which produce their own steam

Who Are the Garment Workers?

Irish and German immigrants were the first workers in the garment industry New waves of immigration contributed Poles, Austrians, Hungarians Russians Italians and Jews of various European backgrounds Most workers in the new industry toiled long hours in miserable surroundings earning barely enough money to keep alive (*See also* Sweatshop System)

Labor laws and gradual unionization of the workers remedied most of the evils which had marked the earlier days of the industry Remnants of the sweating system linger chiefly in contract factories and in homework in towns and rural areas near some of the big clothing centers In such areas local authorities may be lax about labor laws in order to attract new industry Lack of unionization among workers makes it possible for employers to pay low wages

Most garment workers today are skillful and well paid About three-fourths belong either to the International Ladies Garment Workers Union or to the Amalgamated Clothing Workers of America

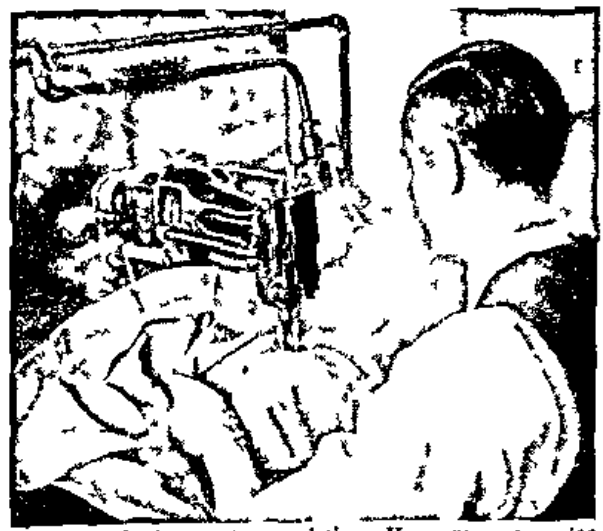
Garment workers are specialists Designers are the artists of the industry Pattern makers and graders are draftsmen Cutters are mechanics They must be able to lay a pattern of many pieces in such a way that no material is wasted and all checks plaids and stripes match at the seams They must be able to cut accurately through many layers Cutting is the highest paid trade of the industry Pressing requires skill and judgment It too is highly paid Sewing breaks down into many different procedures It may take 200 stitching operations to make a man s suit These vary in difficulty and in rate of pay

Training for work in the garment industry may take place on the job or in a vocational high school New York City has a Central High School of Needle Trades

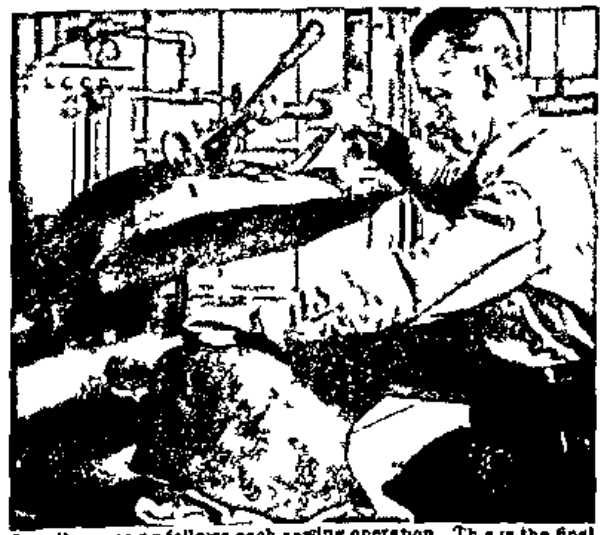
MANY TAILORS MAKE MEN'S SUITS



A cutter uses a round knife machine Suits are usually cut in 10 to 50 layers The number of layers varies with the quality of the suit and the type of fabric



A trouser backer puts in a lining He is using a sewing machine designed especially for this procedure



Usually pressing follows each sewing operation This is the final pressing The powerful pressing machine is operated by steam

GARRICK, DAVID (1717–1779). From the moment in 1741 when he stepped on a London stage until his retirement in 1775 David Garrick reigned supreme over the English theater. The five-foot four-inch Garrick played both comic and tragic roles with great success. After his burial among England's great in Westminster Abbey, Edmund Burke wrote of him: "He raised the character of his profession to the rank of a liberal art."

Garrick changed the style of English acting. When he first came to the stage, actors delivered their lines as formal declamations. Garrick flamboyantly delivered his in the spirit of the character and the words. His style of acting would be called florid today, but then it was deemed naturalistic.

Garrick, the grandson of a French Huguenot refugee of the gentry, was born Feb. 19, 1717. His father was an English army officer who had only his pay to support a large family. The Garricks lived in Lichfield. David's vivacious charm made him a great favorite at the regimental officers' mess. Lifted to the table, he would drolly recite parts heard from strolling players.

David attended the Lichfield grammar school with Samuel Johnson, who was seven years older. Later, when Johnson opened his own school, David and a younger brother were pupils. Johnson's school was not a success. He and Garrick journeyed to London together, Johnson to find work at translating and Garrick to study law. Garrick's father died soon after, however, and David and an older brother started a wine business, with David the London representative.

Garrick Goes on the Stage

The wine business did not prosper, perhaps because Garrick's interest in the stage and actors took much of his time. Masked, he took part in a pantomime. Then, in the summer of 1741, he played with a traveling troupe at Ipswich. Although he knew his family would object, he determined to go on the stage. He returned to London and played his first London professional engagement as Shakespeare's *Richard III* in the Goodman's Fields theater.

His success was immediate. During his first year he played some 19 roles, almost all of which were greeted with acclaim. Johnson said of his success: "More pains have been taken to spoil that fellow than if he had been heir-apparent to the empire of India." Although Johnson often jibed at Garrick himself, he would permit no other to do it in his presence (*see* Johnson, Samuel).

Over the next few years Garrick played in London's famed Covent Garden and Drury Lane theaters and in Dublin. In 1747 he became a partner in the Drury Lane (the fourth theater of the name now stands on the site). As actor-manager, Garrick continued on the stage, except for two years travel on the continent, until his retirement. He played more than 90 roles and wrote some 80 prologues and epilogues and innumerable verses and songs. He either wrote or adapted 35 plays; many were adaptations of Shakespeare's plays (a common practice of the time). Some of his plays were very successful, but none of his writings show great literary merit.

DAVID GARRICK



One of the world's most famous actors, Garrick was for many years actor-manager of London's famous Drury Lane Theatre.

Garrick formed an early attachment for Margaret (Peg) Woffington, a famous actress, but they never married. He did marry Eva Maria Veigel, a Viennese dancer and protégée of Lord and Lady Burlington, in 1749. They had no children. Garrick died in London Jan. 21, 1779.

GARRISON, WILLIAM LLOYD (1805–1879). Regarded by some as a high-minded idealist who was the chief exponent of the antislavery movement, William Lloyd Garrison was regarded by others as an impractical fanatic who performed some good in a disagreeable manner. He helped to found the American Anti-Slavery Society, was for 23 years its president, and for 35 years published the violently antislavery publication the *Liberator*.

Garrison was born Dec. 10, 1805, in Newburyport, Mass. His father, an intemperate sea captain, deserted the family before the boy was three. At 13 years old, Garrison was apprenticed to a newspaper publisher. He became an expert compositor, and by the time he reached 16 was writing anonymously for the paper. At the end of his apprenticeship, when he was 21, he became editor of the Newburyport *Free Press*. In it he published the earliest poems of John Greenleaf Whittier, his lifelong friend (*see* Whittier).

Garrison was almost six feet tall, had sharp features somewhat softened by spectacles, and carried himself erectly. When the *Free Press* failed he went

to Boston where he helped edit the *National Philanthropist* a paper devoted to the suppression of intemperance and other vices In Boston he met the Quaker Benjamin Lundy who turned Garrison's attention to the evils of slavery

In 1829 Garrison gave his first violent address against slavery Later the same year he went to Baltimore to help Lundy edit an antislavery paper One of his articles brought about his arrest for libel He was convicted and served seven weeks of a jail term On Jan 1 1831 he published the first issue of the *Liberator*

Garrison's vitriolic attacks on slavery took him several times to England and about the North Georgia offered a $5 000 reward for his arrest and conviction In Boston a mob once placed a rope about his neck and forced him to parade the street He helped form several antislavery societies among them one in New England and later the national one He preached that the North should secede from the South in Boston in 1854 he publicly burned a copy of the United States Constitution crying So perish all compromises with tyranny!

After the Emancipation Proclamation (1862) he continued to issue the *Liberator* until satisfied that slavery was dead He stopped publication in 1865

Garrison married in 1834 and resided in Roxbury then a suburb of Boston He had seven children two of whom died in infancy Weakened by chronic ill health Garrison was in 1868 tendered the sum of $30 000 by his admirers He died in New York City on May 24 1879

WILLIAM LLOYD GARRISON



The antislavery crusader is shown setting an editorial for his weekly the *Liberator* which he published for many years

Gary Ind The newest and biggest city of the busy Calumet industrial region of northwestern Indiana is Gary Between its west limits and the Illinois state line lie the earlier established cities of the region East Chicago Whiting and Hammond All except Hammond border Lake Michigan's southernmost shore Chicago's Loop is about 25 miles to the northwest

The chimneys of great steel plants cement works oil refineries and other industries tower from the lake front At night tall stacks belch yellow flames and electric bulbs placed scatteringly over high reaching oil refinery towers form unique and awesome patterns against the sky Harbors protected by breakwaters that reach far out into the lake bite deeply into the shore The harbor basins are large enough in which to turn about the biggest of the great ships that bring iron ore coal and limestone to the region The Calumet area produces iron and steel rubber goods clothing books fabricated steel automotive accessories and many other goods

Founding of the Steel City

Gary had its beginning in 1905 when Judge Elbert H Gary chairman of the board of the United States Steel Corporation announced that a large new steel plant would be built on the sands at the south end of Lake Michigan Construction work on the plant began in March 1906 and the city grew up behind it

The site was a dreary waste of sand marshes wind blown sand dunes and scanty vegetation The general ground level of the mill site had to be raised 15 feet This was done by leveling the tall dunes over the marshes The Grand Calumet River was made to flow through a new channel railroad lines were relocated and the sands anchored so that they would not shift under the weight of thousands of tons A boom village of tar paper shacks went up to house workers restaurants and stores In February 1909 the first steel furnace was fired

Business and residence areas were carefully planned As the plan took form straight wide streets were paved and the tar paper shacks replaced with new houses and business buildings Black earth by the train load was brought to cover the sand so that grass and trees could grow, On the lake front Marquette Park named for the Jesuit explorer and missionary who passed through the Calumet region in the late 1600's was laid out with lawns trees flower beds athletic fields and a fine beach Gary now has about 700 acres of parks

The Gary school system, under Dr. William A. Wirt (1874–1938), originator of the educational "platoon" system, employed many new methods. In the Gary system all children, from kindergarten through high school, may work in school kitchens, laboratories, studios, gymnasiums, and in shops in which such trades as carpentry, painting, printing, and metalworking are taught. These progressive techniques were widely admired. Many other schools adopted them. Gary today has more than 100 churches, an excellent library system, a symphony orchestra, and an extension center of Indiana University. One of its nine railroads is a fast electric line running between South Bend, Ind., and Chicago.

Thousands of native American whites and Negroes and immigrants from some 50 nations were attracted to the fast-growing steelmaking city. In 1910 Gary had already grown to 16,802 people. By 1920 these had increased to more than 50,000. In the 1950 census the population of Gary was 133,911, making it Indiana's second largest city (*see also* Indiana). Gary has the mayor-council form of government.

GASES—*The Most* ACTIVE *State of* MATTER

GAS. The most active state in which matter can exist is as a gas. When solids are left to themselves, they will keep their shape undisturbed. Liquids will alter their shape, but they will hold their volume. Gases, however, have neither fixed shape nor size. Turn loose a thimbleful of air into a vacuum as big as a living room, and it will expand and spread out until it fills the whole available space.

The most familiar gases are those that form the air (*see* Air). Eleven of the chemical elements remain in a gaseous state at ordinary temperatures. They are hydrogen, helium, nitrogen, oxygen, fluorine, neon, chlorine, argon, krypton, xenon, and radon. Many chemical compounds such as ammonia and carbon dioxide are gases. Solids and liquids will enter the gaseous state at sufficiently high temperatures, as water does when it turns into steam.

Physical Nature of a Gas

Every gas consists of individual molecules, flying about freely in space and colliding with each other. For example, at ordinary temperatures and at atmospheric pressure, oxygen molecules in the air fly about at an average speed of about 1,500 feet a second between collisions. They collide, on the average, about 4.6 billion times a second and travel about 1/250,000 of an inch between collisions.

If a gas is free to expand (as it would be if it were loose in the air) the collisions will drive some molecules outward at the edges of the mass. This causes the gas to expand indefinitely and mix with any neighboring gases. If the gas is held in a container, many molecules strike constantly against the container surfaces. This bombardment exerts *pressure* upon the container.

Temperature, Pressure, and Volume

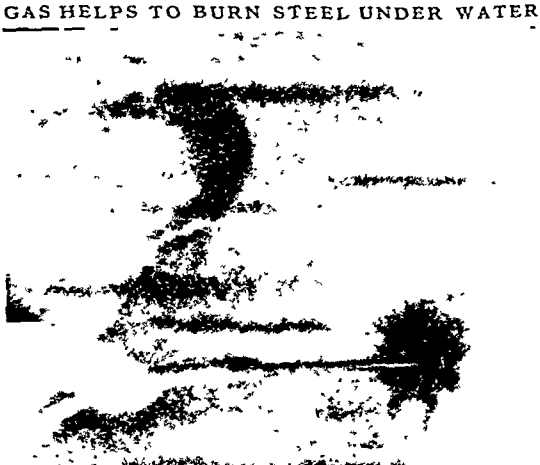
In 1660 Robert Boyle tested the relation between the pressure exerted upon a confined gas and the space it occupied while the temperature was kept unchanged. He found that any change in pressure produced an opposite change in volume, and so the product of pressure and volume remains constant. This is called *Boyle's law.*

The relation depends upon keeping the temperature unchanged, because temperature determines the heat energy in the gas, and the intensity is fixed by the average speed of the molecules. If therefore the temperature is kept the same while a gas is being compressed, the molecules will have the same average speed after compression as before. They will be crowded into much less space, however, and on the average will strike each unit of area in the container more blows every second (or other unit of time) in proportion to the reduction in volume.

In 1785, J. A. C. Charles of France experimented by letting gas expand as the temperature was raised while keeping the pressure constant. Each time the expansion amounted to $\frac{1}{273}$ of the volume for an increase of temperature from 0°C. to 1°C. and the same amount for each additional degree of rise in temperature above 0°C. This discovery is called *Charles's law.* Since in modern physics a temperature of −273.16°C. (or −459.69°F.) is considered *absolute zero* (complete absence of heat), the increase in volume is in proportion to the increase in *absolute temperature.*

This increase in temperature is due to the fact that added heat energy has increased the average speed of the molecules. If held in the same space, they strike more and harder blows upon the container, thus increasing pressure. Pressure can only be kept the same by providing enough additional space in the container

GAS HELPS TO BURN STEEL UNDER WATER



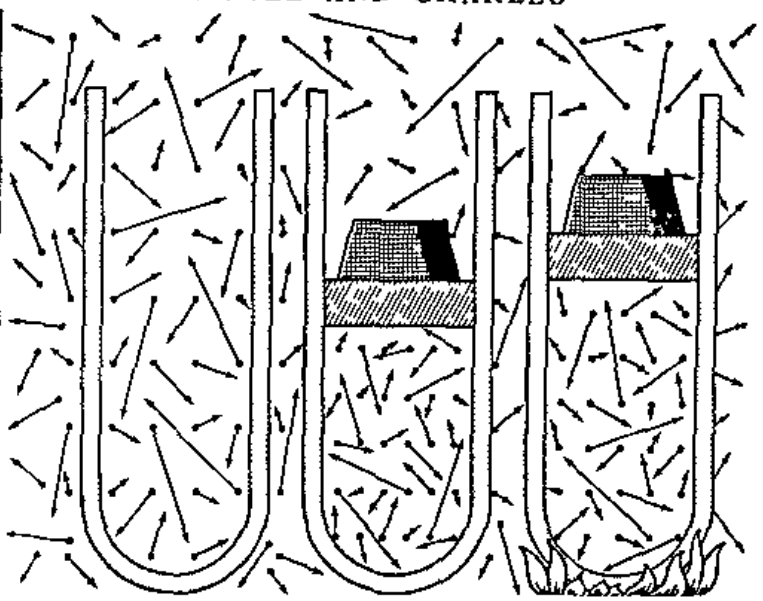
The metal nozzle in the diver's hand and the steel plates of the sunken ship are both connected to an electric circuit. When the nozzle touches the ship, an arc is formed. At the same time a stream of oxygen flows from the nozzle. The oxygen and the intense heat of the arc together burn up (oxidize) the steel and cut open an entry into the vessel.

GAS LAWS DISCOVERED BY BOYLE AND CHARLES



Here the 17th-century scientist Robert Boyle, demonstrates the apparatus he used to discover his law concerning effects of pressure upon gases He obtained various pressures with his improved version of an air pump and applied them to air confined in the closed end of a manometer (a tube partially filled with mercury and open to atmospheric pressure at one end)

In the 19th century, Jacques Charles and J L Gay-Lussac each established the related law that pressure varies in proportion to temperature How air and other gases react in these ways to pressure and temperature changes is shown at right



The left hand diagram shows air molecules flying in and about an open tube When they strike the tube or other molecules, they exert pressure At sea level and freezing temperature, the pressure amounts to 14 7 pounds to the square inch This amount of pressure is called *one atmosphere*

In the center diagram, a weight applies this pressure through a piston to the gas in the tube and compresses it to a certain volume If next the total pressure (from the weight and atmosphere above) is doubled the gas will be compressed into half the volume shown provided the temperature is kept unchanged (Boyle's law)

In the right hand diagram air confined under a weight of one atmosphere is heated This makes the molecules fly faster and hit harder wherever they strike, that is, they exert more pressure, until they relieve the extra pressure by expanding the volume they occupy (Charles's law)

to keep the strength of blows the same upon each unit area of the container surfaces

In nature, any application of force to a gas usually produces a combination of changes in temperature pressure, and volume To work such problems, Boyle's and Charles's laws can be combined into a *general gas law* that can be stated as a formula $pv=kT$ (p is pressure exerted, v is volume occupied, T is absolute temperature, and k is a constant value which depends upon the number of gas molecules that are present, but not upon the kind of molecules)

Avogadro's Molecular Hypothesis

In early days of the atomic theory, scientists were puzzled by differences in the way equal volumes of different gases combine to make other gases For example, one volume of nitrogen (N) and one volume of oxygen (O) produce two volumes of nitric oxide But one volume of nitrogen and three of hydrogen (H) produce only two volumes of ammonia, whereas one volume of oxygen and two of hydrogen produce two volumes of water vapor In 1811, an Italian, Amedeo Avogadro, announced a brilliant theory which explained these and many other combinations Avogadro suggested (as we state his theory today) that *in any given volume of gas, under equal conditions of temperature and pressure, the number of molecules in the volume will be the same, regardless of what kind of gas may be involved* If this were not a *fact*, Boyle's and Charles's laws would not hold true for all gases. According to Avogadro s theory, gases differ in the number kind, and arrangement of the atoms which make up the molecules, but once the molecules are formed, one kind behaves like another (except for weight) in all simple gaseous phenomena, so far as the temperature-pressure-volume relations are concerned This principle became known as *Avogadro's hypothesis*

The hypothesis arises from the fact that in most chemical elements which commonly exist as gases the atoms of each element combine with each other as *molecules*, and the molecules constitute the free-flying particles of the gas Examples of such molecules are those of oxygen (O_2), hydrogen (H_2), and nitrogen (N_2) When two kinds of gas combine, the molecules of each kind break up, and the separated atoms recombine in new molecules such as water vapor (H_2O), nitric oxide (NO), and ammonia (NH_3)

Molecular Weights and Avogadro's Number

Using this principle, scientists can learn comparative molecular weights of gases simply by weighing equal volumes of each gas under the same conditions For standard conditions, scientists use the average atmospheric pressure at sea level (14 7 pounds to the square inch, enough to support 760 mm of mercury in a barometer), the temperature of freezing water (0°C , or 32°F), and a standard volume of 22 4 liters (about as much as $20\frac{1}{2}$ empty quart milk bottles). Under these conditions, the standard volume

of any gas will hold about 602,000,000,000,000,000,000,000 (or 6.02×10^{23}) molecules. This tremendous number is called *Avogadro's number*.

In a mixture of gases, the number of molecules must still be that required by Avogadro's hypothesis, as modified by temperature, pressure, and volume conditions; and the total pressure also must be the same, regardless of kind of molecule. Therefore the total pressure must be the sum of *partial pressures* exerted by each kind of molecule; and to contribute the right amount, molecules of each kind must fly about as though they alone occupied the entire volume (*Dalton's law*).

Deviations from the General Gas Law

Dalton's law shows that in a gas, each molecule acts (except for collisions) as though no other molecules were present. Even in collisions, the molecules have heat energy enough—that is, speed of motion—to rebound from each other without tending to stick together. However, if a gas is subjected to great pressure while the temperature is lowered, the molecules commence to stick, and deviations from the general gas law begin.

The tendency to stick together arises because each molecule is surrounded by a tiny zone of cohesive force. Increase of pressure squeezes the molecules closer together, while lowering the temperature reduces the energy with which they rebound from collisions. At length a state is reached in which the cohesive forces begin to be effective. Then some molecules are gathered into droplets, and thus vapor begins to liquefy (*see* Matter).

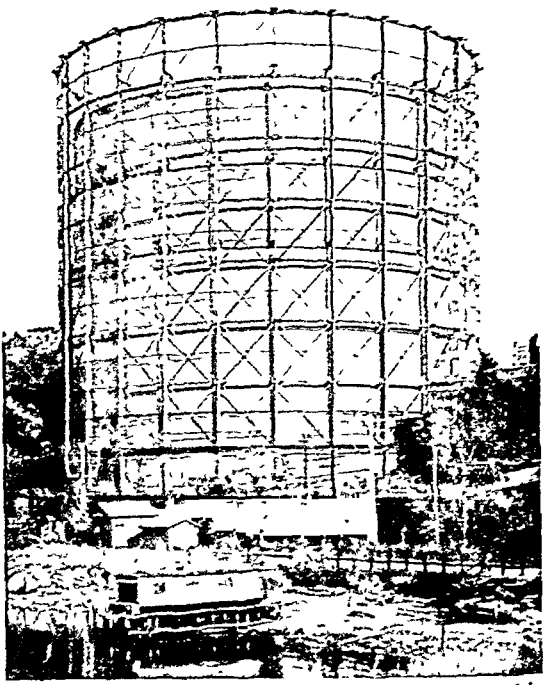
For each kind of gas there is a certain temperature above which no amount of pressure can force liquefaction. The highest temperature at which the gas will liquefy is called the *critical temperature*. The pressure required to produce liquefaction at that temperature is the *critical pressure* for the particular kind of gas.

GAS, MANUFACTURED. About 1792 a Scottish engineer named William Murdock began experiments that brought about the use of coal gas for lighting purposes. He heated coal in a kettle and used an iron tube to carry the resulting yellow gas to a tank. When he had collected enough gas he fitted the end of a tube with a silver thimble in which he had bored a small hole. Lighting the gas that escaped through the hole in the thimble, he found he had a light good enough to read by. He had a gas storage tank, a gas pipe, and a gas jet—a complete gas plant on a small scale.

By 1802 Murdock had succeeded in producing gas in sufficiently large quantities for lighting a foundry. Five years later his discovery was applied to the lighting of streets in London. American scientists who heard of Murdock's achievement followed his example. Gas was used on a small scale for street lighting in Newport, R. I., in 1806, and in 1817 Baltimore installed a system of street lighting.

Today electricity has replaced gas for lighting, but gas is still widely used for heating, cooking, and

THIS HUGE TANK STORES GAS



After coal gas has been freed from impurities, it is stored in great steel cylinders such as the one shown here. The tank rests in a cistern of water and maintains a steady pressure on the gas, thus forcing it out through the mains.

for fuel and power for industries. When coal gas is manufactured today, great ovens of brick, called retorts, are filled with from 250 to 350 pounds of coal. A large gasworks may have a hundred furnaces or more, each heating from five to ten of these retorts. The retorts are tightly closed, and the coal is roasted, producing coke and gas (*see* Coke). This coal gas is a mixture of substances, chiefly hydrogen, carbon monoxide, marsh gas (methane), and other hydrocarbons which burn readily. Nitrogen and carbon dioxide, which will not burn, are also present.

The gas contains many impurities, such as ammonia, tar, sulfur compounds, and water vapor. In gas plants these impurities are taken out to make a colorless, smokeless gas and a clear flame. First, the gas is passed through water, where it loses some of its tar and ammonia. It then passes through a "scrubber" and loses more tar and ammonia. Formerly the tar was not used, but today it is a valuable by-product (*see* Coal-Tar Products). Finally the gas passes through layers of lime or oxide of iron to remove the sulfur. Then it is held in huge storage tanks until used. These tanks are great iron cylinders closed at the top and open at the bottom. They float in cisterns of water and rise as gas is supplied and fall as gas is used. At all times the weight of the tank provides a constant pressure which forces the gas out through the mains.

For many years the flat-tip burner was the only method of using gas for lighting. Two discoveries

revolutionized lighting methods and enabled the production of a much better l ght with the use of less gas One of these the Bunsen burner mixes gas and air in the proper proportion for complete combustion This produces increased heat with an almost color less flame The other was the invention of the incandescent *mantle* in 1886 by Dr Karl Auer von Welsbach of Vienna In the Welsbach system the light comes from a mantle heated wh te-hot in the Bunsen burner The materials for these mantles come from opposite sides of the earth Natives of India grow the China grass whose fiber is needed for weaving the mantles Brazil provides rare earths containing the chemical elements thorium and cerium with which the mantles are saturated After the vegetable fiber of the China grass has been burned away a mineral skeleton" of the fabric is left which glows with a bright white light The illuminating power of gas is increased about three times by the use of the Welsbach mantle

Electric lighting has made the use of gas for il lumination less important than its use as fuel The gas range and gas furnace have largely replaced the coal stoves in homes Their chief advantages are the ease with which the heat can be turned on and off and their general cleanliness

Gas is distributed from the manufacturing plant through main pipes usually 6 to 30 inches in diameter From these smaller service pipes lead to the individual consumers where meters measure the amount used (*see* Meters) The pressure in the service pipes varies in different places from about one to two ounces per square inch In places where the population is scattered over wide areas the use of high pressure gas (from 10 to 20 pounds to the square inch) has been largely advocated

Many cities now use a gas called ' water gas " It consists largely of hydrogen and carbon monoxide, made by passing steam through red hot coke or hard coal This gas burns with a very hot blue flame but it is extremely poisonous because of the high percentage of carbon monoxide it contains To make it fit for use as an illuminating gas it is *carbureted* by mixing in gases such as ethylene and acetylene which burn with a luminous flame

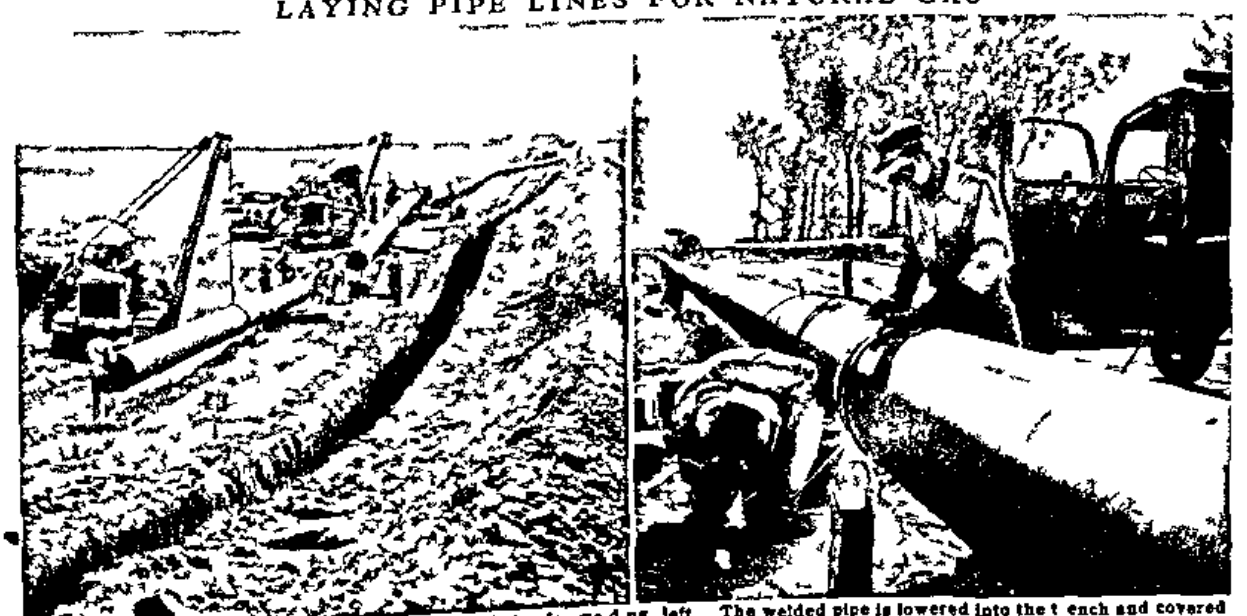
Another gas h ghly useful in industrial processes is *producer* gas The best quality is made by passing air through white-hot coke although coal and even peat may be used Blast-furnace gas generated in the operation of blast furnaces is of this type

Railroad cars in the United States were formerly lighted by compressed *Pintsch* gas distilled from petroleum but now electricity generated on the train is used Acetylene gas is widely used where there are no central gas works (*see* Acetylene) Gasoline is also used for illumination by vaporizing it in a current of air in an incandescent mantle

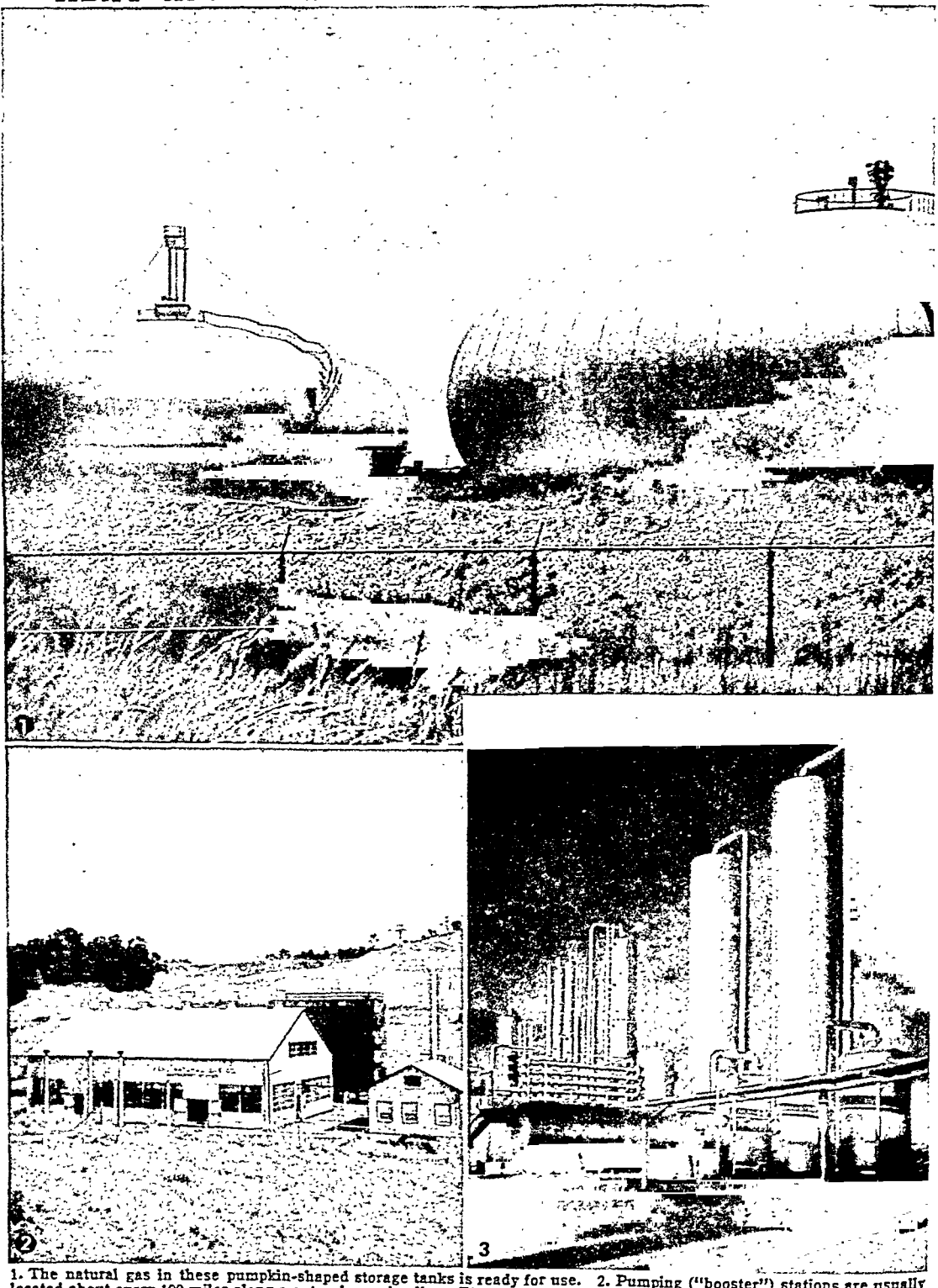
GAS NATURAL For a long time natural gas was regarded merely as a curiosity and as a nuisance In Iran and India it issued from crevices in rocks and the natives kept it burning as a tribute to their fire-god Near Baku on the Caspian Sea—now one of the world s greatest petroleum producing centers—are the ruins of an old temple built on the site of one of these fiery jets

The United States apparently has the greatest wealth of natural gas Burning springs were known in this country as early as 1775 and the first discovery of gas by dr lling was made in the 19th century Workmen boring a salt well in Ohio struck a gas pocket and when the gas flamed forth they fled crying We have drilled through to hell!

LAYING PIPE LINES FOR NATURAL GAS



Tractors equ pped with side booms hold sections of pipe for we d ng left The welded pipe is lowered into the t ench and covered w th d rt When necessa y a steel col ar s welded a ound the junct on of two p pes ight Such re nforcement called line loop ng is used when p pes are la d unde water



1. The natural gas in these pumpkin-shaped storage tanks is ready for use. 2. Pumping ("booster") stations are usually located about every 100 miles along a natural gas pipe line. The station increases the pressure of the gas to move it along to the consumer. 3. Absorption plants scrub natural gas from gasoline by passing it through oil which absorbs the gasoline.

In 1821 natural gas was used for lighting in Fredonia, N Y, but it was not until 1872 that it began to be collected and piped on a commercial scale The beginning was made in Titusville, Pa, in the heart of the Pennsylvania oil regions Since that time the natural gas industry has had a tremendous growth Natural gas is used in many places to enrich the manufactured variety

Natural gas is a mixture of combustible gases and vapors, chiefly methane At some places it is found alone At others it is mixed with oil and must be extracted At still others it occurs with oil but is not mixed with it Nearly all oil fields have gas Its natural reservoir is porous rock, such as a coarse-grained sandstone or limestone with a covering of heavy shale which keeps the gas in and keeps out air

In most gas fields the gas-bearing beds are arched up and the gas is accumulated in the arches often above oil (*see* Petroleum) Wells are sunk to depths of 250 to 9,000 feet or more and are from two to eight inches or more in diameter Natural gas is found mostly in the United States and in Poland, Rumania, Russia Germany France India, China, and Japan Chief producing centers in the United States are Oklahoma, Texas, California Louisiana, Kansas, New Mexico, and West Virginia

Billions of dollars' worth of natural gas were once wasted at oil fields where great flaming wells blazed unchecked for months At one Oklahoma field, gas worth $75,000 escaped every day for a year while only $25 000 worth of oil was collected daily When the great Mary Sudik No 1 well broke loose in Oklahoma, 100 000 000 cubic feet of gas was wasted daily for weeks before it was brought under control

The problems of gas transportation are rapidly being solved The industry has come to rival that of coal, oil and electricity for producing heat and power But long-distance pipe lines are so expensive to install that natural-gas fuel will probably always be more costly than coal at most places It is very clean and convenient and millions of American homes use natural gas for heating cooking or both

Great pipe-line systems similar to the oil pipe lines which form a network over the country, now carry natural gas from its source to far-distant communities Lines from Louisiana serve New Orleans Atlanta, Birmingham and St Louis Lines from Texas run to Denver, Chicago, Detroit Philadelphia and New York City, about 2 000 miles away West Virginia gas is carried to Pittsburgh and other eastern cities Welding of pipe joints, with expansion joints and elastic couplings, prevents leaks Hundreds of thousands of miles of pipe lines have been built and new projects are under way Compression or 'booster' stations every 100 miles along a line maintain pressure Microwave radio links offices terminals compressor stations, and field crews for operating some lines

The *storage problem* is solved in part by holding the gas in its natural reservoirs until it can be used, or by storing it in abandoned gas fields 'One such abandoned field now in such use holds six times as much gas as all the steel gas holders in the country.

A by-product of gas and oil fields and of refineries is known as LP-Gas (liquefied petroleum gas) This is largely a mixture of butane and propane (*see* Hydrocarbons) It liquefies readily under pressure and is distributed in tank cars, in tank trucks and in small steel cylinders On farms and in communities where supplies of regular gas are insufficient LP-Gas is widely used for cooking and heating It can also be used as a tractor fuel

Carbon black a fluffy black pigment is secured by burning natural gas beneath an iron plate Its chief use is in making automobile tires (*see* Rubber) This pigment is also the basis of printing ink and is used in phonograph records paints, typewriter ribbons insulating materials arc-light carbons brushes for electrical machinery and stove polish Texas and Louisiana are the chief producing states and supply over 60 per cent of the country s output, but carbon black is made also in West Virginia, Kentucky, Montana and Wyoming

GASOLINE. The most important single product of petroleum is gasoline This valuable fuel exists in crude petroleum as a mixture of paraffin base hydrocarbons Each molecule has from five to ten carbon atoms, making the substance highly inflammable This quality is vital in gasoline s role as a motor fuel

Commercial gasoline is a blend of gasolines from three stages in the refining process The first is *natural* gasoline, taken from natural gas that rises from oil wells *Raw* or *straight run* gasoline is one of the fractions drawn off from the fractionating tower The third is *cracked* gasoline, made by breaking down other fractions (*see* Petroleum)

In older automobile engines the gasoline vapor in the cylinders was compressed to one fourth its volume before being ignited Higher compressions would give more power but could not be used, because the vapor exploded too soon and "knocked" In 1922 Thomas Midgley, Jr, and T A Boyd found that adding tetraethyl lead and ethylene bromide to gasoline permitted greater compression without knocking 'Ethyl" gasoline was first sold in 1923

In 1930 engineers adopted the *octane number* test for rating the antiknock quality of fuels Two test hydrocarbons are used One heptane knocks violently The other, iso-octane, can scarcely be made to knock at all The fuel to be tested is used until it begins to knock Then a mixture of heptane and iso-octane is found which matches the fuel in knocking The percentage of iso-octane in the mixture is called the *octane number* of the fuel The higher the octane number, the more compression the fuel will stand

Refiners soon learned to improve the octane-number ratings of ordinary gasoline In 1933 they arranged with the patent owners to use ethyl in ordinary grades, provided these were kept about 5 octane numbers below ethyl grades These modern fuels make possible compression ratios of more than 6 to 1 in automobiles Airplane engines use even higher octane fuels

LEADER OF THE FREE FRENCH



In the second World War, General de Gaulle—alone of all France's political and military leaders—inspired and directed his nation's underground resistance to the German conquerors. Here he greets admiring followers. Later he became provisional president of France.

GAULLE, CHARLES DE (born 1890). Few people outside the military circles of France and Germany knew about Gen. Charles de Gaulle before June 18, 1940. On that day he broadcast from London to the French people: "France has lost a battle, but she has not lost the war." This proud challenge launched de Gaulle into world prominence. His broadcasts helped to unify those of the French people who refused to submit to Nazi domination.

De Gaulle, a tall, austere, aloof, French soldier, assumed command of the Free French and led the resistance movement because no other leader appeared. His old friend and former commander, Marshal Henri Philippe Pétain had surrendered and had become head of the Vichy régime under German domination.

Charles de Gaulle was born at Lille, France. Although he was an active boy, eager to attempt the new and difficult, he always found time for reading. Upon graduation in 1911 as an honor student from Saint-Cyr, the West Point of France, he chose to serve in the regiment commanded by Pétain, at that time a colonel.

Fighting under Pétain in the first World War, de Gaulle was wounded twice. At Verdun in 1916 he was captured by the Germans, who took him to Magdeburg prison. With characteristic determination, he tried five times to escape but failed, and was not released until the end of the war.

For a time he taught military history at Saint-Cyr. Then he was chosen to attend the French War Academy at Paris. Later he rose to lieutenant colonel and became secretary general of the Superior Council of National Defense, the highest military authority in France. While holding this position, he wrote 'The Army of the Future', explaining the necessity for mechanizing the infantry. Most French military leaders laughed at his ideas. In Germany, however, many of his suggestions were adopted.

Early in 1940, when the Germans were again pushing into northern France, de Gaulle became a general and took command of a newly formed mechanized division. But it was too late to check the Nazi Panzer forces. On June 17, 1940, Pétain asked Hitler for peace terms. Next day de Gaulle flew to London. He went on his own responsibility, not knowing how he would be received. But Prime Minister Churchill supported him and de Gaulle built up a French army of volunteers. He kept in touch with the underground factions in France, who in 1942 united and accepted him as their leader. Snubbed by some Allied leaders, he continued to lead the Free French, later known as the Fighting French. After the American invasion of North Africa, he joined Giraud in Algiers as co-president of the French Committee of National Liberation, later becoming sole president of the organization and chief of the armed forces.

Defying enemy snipers, de Gaulle entered Paris on the heels of the retreating Germans, Aug. 25, 1944. His avowed intention was to restore France "as a great world power." Appointed president of the provisional government, he tried to weld French political factions into a strong national regime. An ardent Catholic, he opposed extremist measures of both Communists and reactionaries. He sought a moderately liberal program embracing some socialized experiments, such as nationalizing the Bank of France. When opponents tried to strip power from the presidency in 1946, he resigned from office.

But the new constitution plunged France into the troubles de Gaulle had foreseen. In 1947, in an effort to get a strong, central government, he organized a new political party, Rally of the French People. His political strength ebbed, however, in 1953 and he dissolved the party. When France was torn by political strife and unrest over the Indo-China war in 1954, aging de Gaulle hoped to be called to power.

GEHRIG, HENRY LOUIS (1903–1941). On June 1 1925, a husky baseball rookie came into the New York Yankee lineup as a pinch hitter. He was Lou Gehrig. Rookie Gehrig hit a single, and so started one of the most remarkable records in baseball. From that day he played in every game, regular and exhibition, until 1939. Then a mysterious illness forced his retirement. It was finally diagnosed as a type of paralysis, and brought death two years later when Gehrig was only 37.

Gehrig was born in New York City, on June 19, 1903. His father, an iron worker, spurred Lou's interest in athletics by taking him to a gymnastic club. But just before Lou graduated from grammar school, Henry Gehrig became too ill to work. Mrs. Gehrig and Lou worked to support the family. Lou still had time for athletics at the High School of Commerce and played on several school teams. At first he was awk-

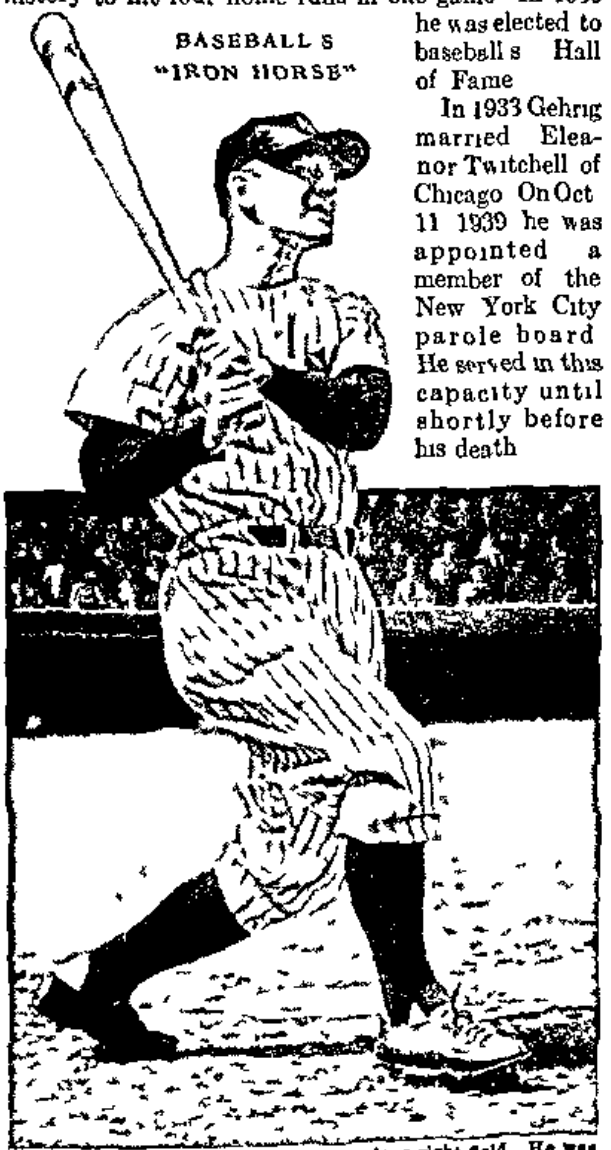
ward and uncoördinated, but he practised constantly to overcome his weaknesses Even as a star Gehrig was the first and last man on the practising field

At Columbia University, Gehrig pitched played outfield, and first base In June 1923, he signed a Yankee contract and was farmed out to Hartford, Conn , in the Eastern League for two seasons Gehrig won the regular first base position with the Yankees the day following his pinch hitting assignment and played continuously until April 30 1939

Gehrig played in 2,130 consecutive games on the Yankees' regular schedule a record that still stands For this achievement sports writers nicknamed him the "Iron Horse " He had a lifetime batting average of 340 and was twice voted the most valuable American League player He hit 494 home runs—47 in 1927—and was one of the few players in baseball history to hit four home runs in one game In 1939 he was elected to baseball s Hall of Fame

BASEBALL S "IRON HORSE"

In 1933 Gehrig married Eleanor Twitchell of Chicago On Oct 11 1939 he was appointed a member of the New York City parole board He served in this capacity until shortly before his death



Lou Gehrig slams a long line drive to deep right field He was left handed both at bat and in the field In the batting order he usually came up fourth, in the cleanup position His famous teammate, Babe Ruth, came up third

GELATIN The quivering, variously colored dessert so often served with cream in a jellylike mound is a good example of one of the many uses of gelatin—as a foodstuff It is used to make puddings, jellies, soups, salads, and so forth

Gelatin is a hard, yellowish semitransparent substance extracted from the white connective tissues bones and skins of food animals It is a protein food of moderate nutritive value, and it helps digest other foods Vegetable gelatins are made from Irish moss and other seaweeds

Chemically gelatin is the same as glue (*see* Glue) The bones are treated with hydrochloric acid then are boiled to remove mineral matter Crude gelatin is cut into slices dried, and sold as glue Gelatin may be purified by dissolving it in hot water and adding alcohol Purified with sulphurous acid and other chemicals, later removed it makes the tough, whitish semitransparent 'isinglass" used in refining liquors and stiffening food Another kind of isinglass is obtained from the air bladders of fish

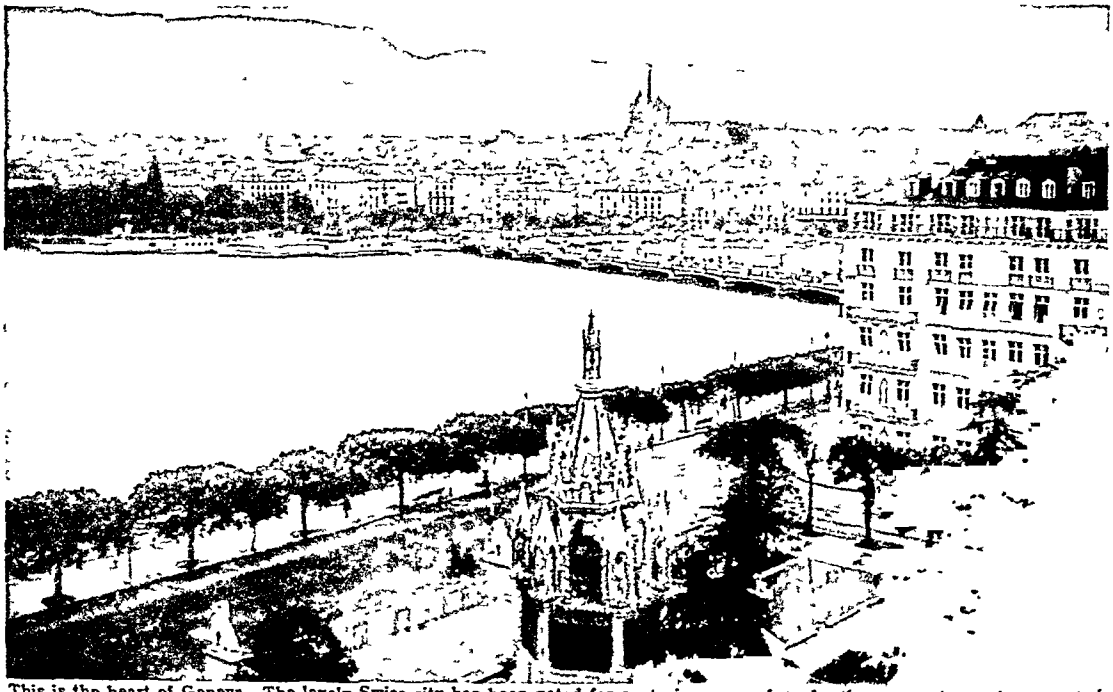
Gelatin is one of the ingredients of printing press rollers It is used as a coating or capsule for pills, in dyeing and tanning and in making paper, waterproofing material, India inks, artificial leather, and artificial silks It forms the base in which are embedded the sensitive chemicals used to coat photographic plates, films, and papers Since gelatin is a colloid (*see* Colloids), it tends to prevent the growth of crystals where it is present and being an emulsifier it helps hold in union two liquids that otherwise would separate A solution containing more than one per cent gelatin becomes stiff when cooled

GENEVA (French *Genève* German *Genf*), SWITZERLAND Its natural advantages and its political history have made the city of Geneva a unique center of international activity and of freedom of thought

For centuries the Swiss have protected refugees from political and religious persecution, and many of these settled in Geneva because of its convenient location International contacts were easily maintained, because Geneva stands at a natural 'crossroads " On the west lies France To the northeast, a broad valley gives access to Germany To the southeast short routes lead over the Alps to Italy The city s location on Lake Geneva (or Lac Leman) also gives it great scenic charm which attracts hosts of tourists from all over the world

The whole world recognized the international character of the city in 1864 by selecting it as headquarters for the International Red Cross Other organizations that established themselves there were the Students' International Union, the Geneva School for International Studies, and the Inter Parliamentary Union The crowning recognition came after the first World War, when Geneva was chosen as the seat of the League of Nations Ariana Park, on the outskirts of the city, was chosen as the site of the spacious Palace of the League of Nations, completed in 1936 In 1946 the League turned over to the United Nations the Palace and other buildings, including the library donated by John D Rockefeller

INTERNATIONAL MEETING PLACE AND CENTER OF FREEDOM



This is the heart of Geneva. The lovely Swiss city has been noted for centuries as a refuge for the persecuted and as a seat of international activity. We are looking across the southwestern tip of Lake Geneva at the point where the Rhone River flows out of it, cutting the city in two. At the left is the yacht basin and the bridge is the Pont du Mont Blanc. The mountains in the background form part of the Mont Blanc chain.

Various specialized agencies of the United Nations and other international organizations have their headquarters in this large, handsome structure. The International Labor Office Building on Lake Geneva was transferred to the International Labor Organization. (*See* League of Nations.)

During the Reformation, Geneva was known as the "Rome of Protestantism." John Calvin made his headquarters here from 1536 until his death. Calvin practically ruled the city and gathered about him many other Protestant reformers (*see* Calvin).

In 1559 Calvin founded an academy which became part of the University of Geneva in 1873. For many years the city has been noted as a cultural center. Voltaire lived for years at near-by Ferney. When Napoleon rose to power, his bitter enemy, Madame de Staël, established her famous *salon* in a château on the north side of the lake, at Coppet. Everything here remains just as she left it, and today the château attracts many visitors.

Tree-lined promenades and luxurious tourist hotels surround the lake in Geneva. The city has beautiful university buildings, and magnificent palaces house the international organizations. Snow-clad Mont Blanc, 40 miles to the southeast, tops near-by Alpine peaks. Manufactures include watches, jewelry, instruments, machinery, and chocolate. (*See also* Switzerland.) Population (1950 census), 145,473.

Lake Geneva, 45 miles long and 9 miles wide, is the largest lake in Switzerland. At the other end from the city of Geneva, near Montreux, is the Castle of Chillon, made famous by Byron's poem, 'The Prisoner of Chillon'.

HEADQUARTERS OF THE INTERNATIONAL RED CROSS



National Red Cross societies communicate through their international committee here. During wars it is the clearinghouse for information on war prisoners. It handles their mail, inspects camps, and arranges exchanges.

GENGHIS (*jĕn'gĭs*) **KHAN** (1162 1227) From the high wind-swept Gobi Desert came one of the world s great warriors He was Genghis Khan a Mongolian nomad With his fierce hard riding nomad horde he conquered an empire that stretched through Asia from the China Sea to the Black Sea This huge realm was greater in size than all North Amer ica (*See also* Mongols)

Genghis Khan was born on the Gobi Desert in a *yurt* (felt tent) on the bank of the Onon River in northern Mongolia His father Yesukai was chief of several tribes and had just slain a foe named Temujin In tri umph Yesukai named his new born son Temujin

Yesukai died when Temujin was 13 years old The boy became chief But the fierce restless nomads would not obey so young a ch eftain The chief of another tribe proclaimed himself leader of the Mongols and captured Temujin Guards forced Temujin into a *kang* a wooden yoke *that shackled* his shoulders and wrists But in the dark of night Temujin slowly twisted *himself to reach* above a guard and smashed the kang down on his head Leaping over him Temujin raced to the river pushed into the *reeds and crouched* in water up to his chin to hide

Temujin s bold courage and resourcefulness began to win followers When he grew to manhood he con quered the Tatars and joined them to his tribes In 1203 he defeated the Keraits Seizing their cities of mud and stone he made Karakorum his capital

In 1206 a council of his tribes named him ' Genghis Khan It meant Greatest of Rulers Emperor of All Men Genghis Khan then put all his Mongolian realm under *Yassa* a body of laws he assembled from various tribal codes Tl ese laws demanded obedience to Genghis Khan unity of *the tribes and pitiless punishment of* wrongdoers Yassa enabled Genghis Khan to achieve the discipline that welded his wild tribesmen into merci less successful armies

GENGHIS KHAN



This chief of Mongol nomads was one of the greatest conquerors in history His arm es overran As a

On his march of conquest Genghis Khan overran Cathay or north China in 1208 15 Wheeling westward his horde conquered Turkestan Then his armies engulfed ne ghboring countries even part of Ind a In 1222 the Mon gols struck into Europe at the Don River After defeating the Russ ans they pushed to the Dnieper Victor ious Genghis Khan returned east At his death his empire passed to his sons.

GENOA *ITALY The beauty loving* Italians call Genoa La Superba — The Proud Rising from the Gulf of Genoa in white *relief against the sharp slopes of the* Apennines it is a magnificent sight Along its steep streets are superb medieval churches and ornate marble palaces of Renaissance times Proud too is the city s heritage for Genoese mariners made some of the boldest voyages of discovery and conquest

THE HOME OF COLUMBUS AND A VIEW OF GENOA'S PORT



At the left we see the remains of the boyhood home of Christopher Columbus The house is only one room wide It stands near Genoa s business d str ct The p cture at the right shows part of the modern port Powerful booms on the quays stand ready to lift cargoes from the sh ps In the background we see the c ty s build ngs ris ng from its steep hills The barrels in the foreground contain resin shipped *from the* Mid d e East Genoa is one of the Mediterranean s greatest importing ports

And here, at the harbor edge, the young Christopher Columbus dreamed of faraway lands.

Since the Middle Ages Genoa has been a thriving port, for it is one of Italy's few outlets on the west coast. This situation later became an enormous advantage when the tide of commerce turned westward, for it lay nearer the Atlantic than its old rival Venice. Today Genoa is Italy's chief port and the gateway to the great northern plains which are the heart of the nation's agriculture and industry. Linked to Switzerland by the great Simplon and St. Gotthard tunnels, it handles much of the bulky imports destined for the Swiss nation and for southern Germany. With its warehouses, storage tanks, foundries and shipyards, it is a bulwark of Italy's industry. Hence, during the second World War, it was bombarded from the sea and the air by the Allied forces.

The city has an eventful history. Both the Lombards and Franks once held it, but, when Charlemagne's empire broke up, it became an independent city. It fought a long series of wars with Pisa, its southern neighbor, in which the latter was crushed in 1284.

Genoa's foreign trade and maritime power increased greatly during the Crusades. It had colonies in Spain and North Africa, conquered from the Saracens, and trading posts and fortresses in the eastern Mediterranean and along the Black Sea. Its commercial rivalry with Venice led to a series of wars that ended with Genoa's defeat at Chioggia in 1380. Its eastern trade never recovered from this blow.

Many of Genoa's noted mariners, turning elsewhere for ships, entered exploring expeditions sent out by foreign monarchs. The most famous Genoese discoverers were Columbus and the Cabots.

The aristocratic and democratic factions in Genoa were in constant turmoil up to the 16th century, when the autocratic rule of the doges began. The famous Bank of St. George was founded in the 12th century. In the Middle Ages this small group of merchant capitalists virtually dictated laws and gave orders to the government.

Genoa's historic wealth is reflected today in imposing churches, palaces, schools, libraries, and museums. Its university was founded in 1471. Corsica, the last of the city's foreign possessions, revolted and was taken by France in 1768. Sardinia-Piedmont acquired the city in 1815, and it became a part of the kingdom of Italy with the union of the peninsula. Population (1951 census, preliminary), 678,200.

GENTIAN (*gĕn'shŭn*). When autumn leaves are turning gold and red, the lovely gentians open their sky-blue blossoms. They grow in moist woods and meadows and along the banks of streams The exquisite beauty of the fringed gentian made it a victim of flower hunters, and it is now one of the rarest of all wild flowers. The bottle, or closed, gentian is also becoming very scarce. These flowers should never be gathered even for transplanting. Only the expert can make them grow in gardens.

FRINGED AND CLOSED GENTIANS



At the top, the fringed gentian opens its bell-like blossoms. Bottle gentians and soapwort gentians bear the lighter blue closed flowers pictured below.

The fringed gentian is found from Quebec to Georgia and west to the Dakotas and Iowa. The flowers are vase or funnel shaped and are about two inches broad. The four violet-blue petals are delicately fringed. This is a device of nature to keep ants out of the nectar at the base of the vase. The blossoms grow singly at the top of an erect stem one to two feet high. (For illustration in color, *see* Flowers.)

The bottle, or closed, gentian looks like a cluster of six or eight blue bottles at the top of the stem. They are set in the bases of the upper pair of leaves. Only the big bumblebees can force their way into the tightly closed petals and reach the nectar.

In the mountainous parts of the United States, there are many other gentians, with flowers of blue, purple, white, or pale yellow. The dried roots of the European yellow gentian yield a drug, which is also called gentian. It is used as a tonic to improve digestive action. The flower is named in honor of Gentius, a king of ancient Illyria, because he is said to have discovered the medicinal value of the plant.

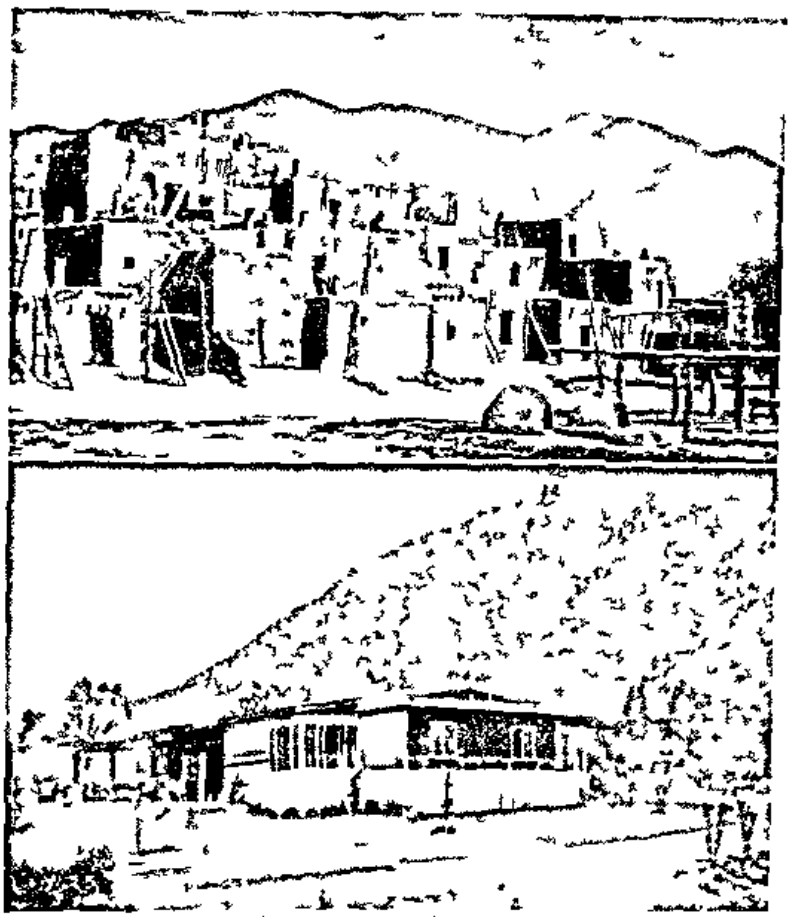
Gentians form the genus *Gentiana* of the family *Gentianaceae*. There are more than 300 species in the northern hemisphere, about 70 of them in the United States. Scientific name of fringed gentian, *Gentiana crinita;* closed, or bottle, gentian, *Gentiana Andrewsii;* soapwort gentian *Gentiana saponaria;* yellow gentian, *Gentiana lutea.*

GEOGRAPHY—*Studying the* EARTH *as* MAN'S *Home*

GEOGRAPHY Throughout the ages man and nature have been writing a story on the face of the earth The story is ever changing It will never be finished as long as the waters keep wearing away the hills and men continue to build cities and clear wood land for the plow It fascinates those who know how to read it and it is vital to all mankind

The science of geography deals with this story The word geography comes from Greek terms meaning the earth ' and to write Geography describes the landscape which natural forces and the work of man have created It brings out the interrelat on sh ps between men and their surround ings or environment

It explains how people are influenced in the way they live and work and play by the kinds of land and water air rainfall and sunshine that surround them It reveals the part men s own talents ambitions and l mitations play in using and developing the land scape and its resources It helps peoples to understand one another because we can appreciate others only when we stand in their shoes and face the r problems



These pictures show how different houses in the same environment may reflect the sk ls and resources of the bu lders The Ind ans who bu lt the pueblo at Taos N M top p cture could use only the adobe clay br ck and t mber found at hand The architect for the Ar zona desert house bo tom picture could h ng mate als f om anywhere in the count y and make a fine air cond t oned home

Reading the Geography Story

People begin as children to read the story man and nature have written on the face of the earth A boy learns his way home from school by observing the streets and buildings in his home town or the hills and streams of a farm landscape In the city he finds that some buildings are stores others homes or apartments and still others are factories or churches The railways with their speeding trains and the highways crowded with cars fascinate him He comes to understand that they tie h s town to ne ghboring cit es and to the wide world beyond

The adult reads the geography story wl enever he travels When he awakens after an overnight train trip he looks at tl e landscape to locate himself As he goes along by day he not ces whether tl e cities are large or small and whether the land is level or mountainous He may be interested in the kinds of in dustries the varieties of trees plants and animals and the type of houses people build

Exploring by Travel and by Using Books

THE GEOGRAPHIC explorer who enters an unknown land makes these observations and many more He tr es to learn what the natural en vironment provides for the people and how they have used their advantages and overcome their handicaps How do they provide the r food sl elter and clothing? Do they trade w th other peoples to get goods they cannot make at home? Have tl ey created a just and sound government? Do they have schools churches books art works and other things that enrich their lives? After gathering the facts the geographer fits them together He attempts to reach an understanding of the special character or personality which the works of man and nature together g ve the region

The student of geography makes the same observations as the explorer He does not do so by traveling over the globe Instead he uses books articles maps and pictures He sees that places and peoples are dif ferent in many ways and he tries to find reasons for the d fferences he d scovers

Different Dwellings around the World

Differences in kinds of houses are easily observed whether the student travels or uses pictures Even within tl e Un ted States many contrasts are apparent Frame houses are abundant in this land where widespread forests have provided a plentiful supply of lumber But in large crowded c t es there is not enough land to permit building a dwelling for every

A SHEEP-GRAZING REGION IN THE CAUCASUS MOUNTAINS



All over the earth people seek to make the best use of their land. Here we see a mountainous area in the Georgian Soviet Socialist Republic. Much of the land is too rugged for farming, but sheep will fatten on the grassy slopes. A shepherd is driving his flock to high pasture after the mountain snows have melted in spring. They are crossing a Georgian military road.

family. Huge apartment buildings, many stories high, are built of brick, stone, or concrete. They provide homes for most of the people in these congested centers.

Other kinds of housing can be seen in regions where little or no timber grows. The Indians of the arid Southwest use sun-dried brick for their adobe houses and pueblos Early settlers in the nearly treeless Great Plains lived in sod houses until they could buy and transport lumber.

Around the world even more striking contrasts appear. In the Swiss Alps, picturesque farm houses of stone and wood have steep, shingled roofs to throw off the abundant rain and heavy snow. In dry, sunny Greece, thick stone house walls support roofs that are nearly flat. The pastoral folk of Africa's vast northern desert pitch tent dwellings as they wander about seeking grass for their flocks In the villages built around the water holes, the flat-roofed houses have thick walls of sun-dried brick and narrow windows.

To the south in the rain-drenched Congo forests, the people build steep, sloping roofs by fastening long poles together at the top and covering them with mats woven of long, narrow palm leaves. Saplings are lashed together and daubed with clay to make walls. On tropical islands of the South Pacific, the people use bamboo stems and palm leaves to build thatched "stilt houses." These airy dwellings may be lifted on poles above the sea or above the moist jungle growth. (For examples of these and other types of dwelling, see the entry Shelter in the FACT-INDEX.)

Differences in Use of the Land

Differences can also be seen in the way the land is used. A huge portion of the earth's land is used for farming. There are endless kinds of farms, and even the same kind may differ in two places. In Wisconsin, fine pastures and large barns with huge silos suggest the importance of dairy farming. In Oregon, where cattle find pasture throughout the year, dairy farms seldom need large barns or silos

Iowa's huge farms have broad acres of corn, stock pens, big barns, corn cribs, and other buildings. Tractors, corn pickers, and other modern farm equipment show that the farmers have the advantage of using machines to cultivate and harvest their crops. Grain and livestock farms in the Danube basin of Europe differ greatly from these modern American farms. Striking differences can be seen in the homes and even more in the amount of machinery in use.

The French vineyards, the Chinese rice paddies, the Brazilian coffee *fazendas*, the Mexican *haciendas*, the Argentine *estancias*, the rubber plantations of New Guinea, the pineapple fields of Hawaii, the Cuban sugar plantations, and the citrus groves of California are other noticeable types. They show different ways in which people use farmlands in different environments (For pictures of various types of farms, *see* articles on the states and countries mentioned.)

Lands used for graz ng offer contrasts with cult vated lands Usually they are too rough for the plow or the cl mate is too cold or too dry for crops Various graz ng lands d f fer from one another too Cattle ranching in the h ghlands of northern Mex co has l ttle in com mon w th re ndeer graz ng as carr ed on by the Lapps of Norway

Industrial Uses of the Land

Where the earth yields valuable minerals people find it profitable to use the land for m ning Con trasting types of mining include the open p ts of the Lake Super or iron ranges the bituminous coal mines in the Appala chian fields and placer mining for tin in Malaya

PLACER MINING OF TIN IN MALAYA

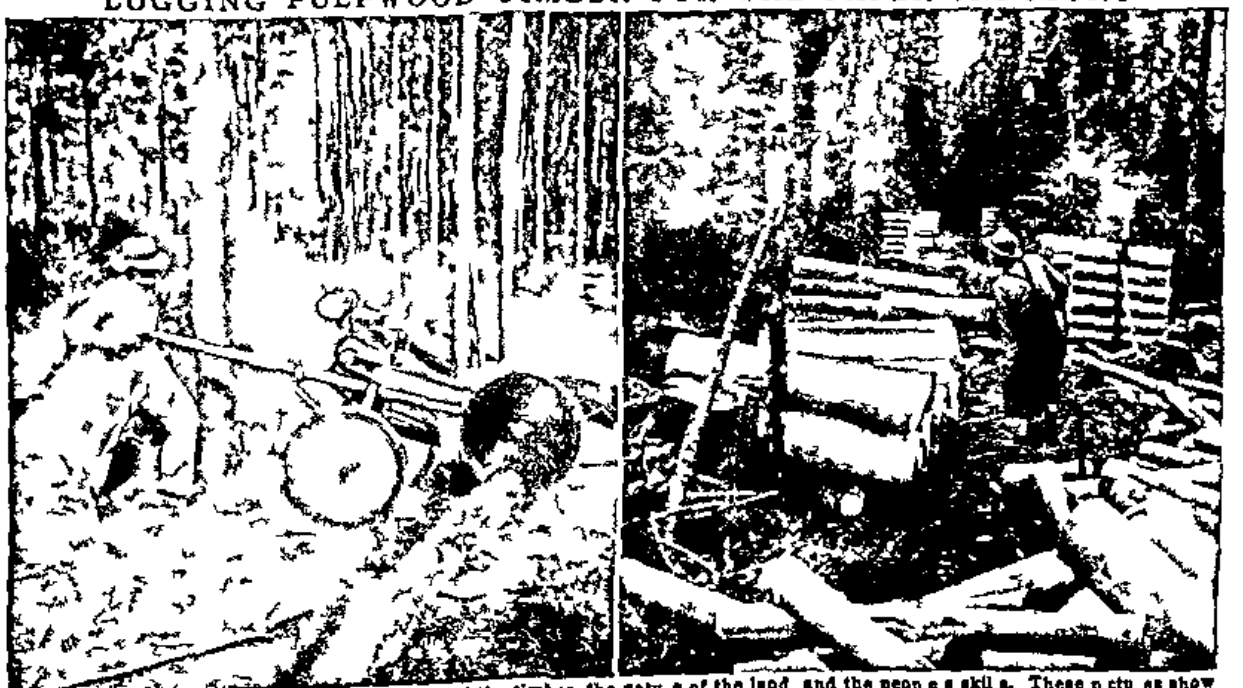


M nes and m n ng me hods vary w de y ove the wo d He e a powerfu je of wa e is tearing o ay, and sand f om he g ound above a t n depos La e he mixtu e w flow th ough a flume The heavy o e w ll co e t on the bo om and the ligh e sand and c ay will wash away

People engage in logging and lumbering where they find forested land—provided of course that they can transport the logs and lumber to market at a profit Logging and lumbe ng methods differ with var et es of timber and land surface Logging of great Douglas firs in the Pacific Northwest calls for methods different from those used in cutt ng pulpwood in Canada or in the pine forests of the South

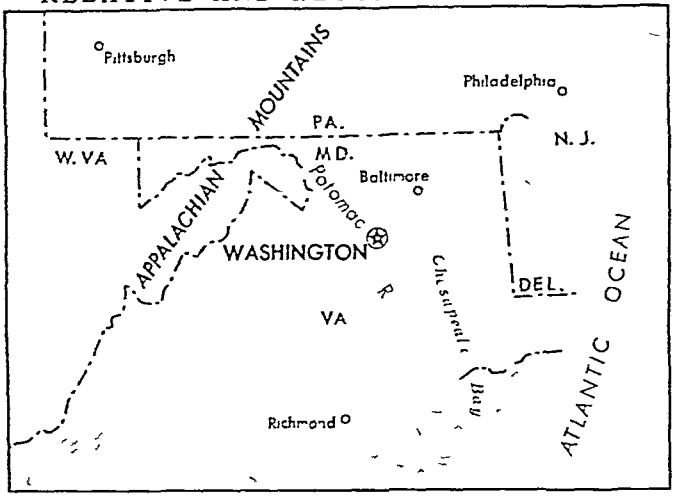
Thousands of different manufacturing industr es are scattered over the world s lands They vary f om primit ve hand crafts such as basketmaking and sim ple process ng of raw materials l ke canning fru ts

LOGGING PULPWOOD TIMBER FOR THE PAPER INDUSTRY

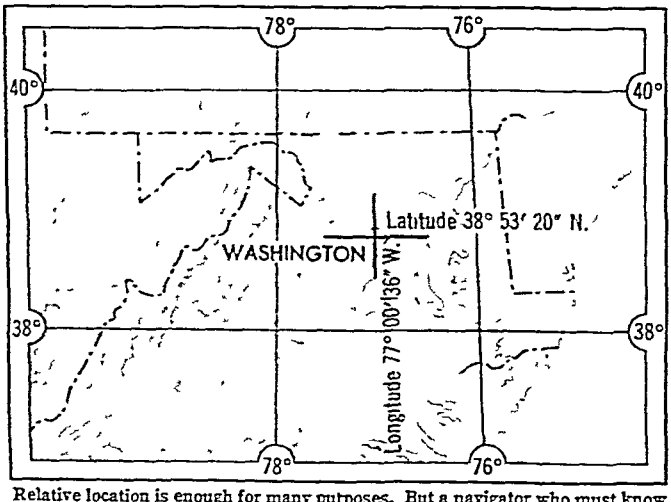


Lumbering me hods vary a co d ng to the size *of the timber* the natu e of the land and the peop e s skil s. These p ctu es show a small powe saw for cu ting s ende pu pwood ogs in o engths and a man s acking he ligh engths by hand The ba k has been pee ed from the logs be ause t is not su ab e fo pape making

RELATIVE AND ABSOLUTE LOCATION



A student can locate Washington, D. C., in relation to many natural and political features on this map. He sees at once that it is east of the Appalachians and not far from the Atlantic. It is situated on the Potomac River, on the borders of Virginia and Maryland, and on several railway trunk lines. It is southwest of Baltimore, southeast of Pittsburgh, and north of Richmond.



Relative location is enough for many purposes. But a navigator who must know the exact location of a place needs a map or a latitude and longitude table. Knowing the latitude helps him understand the climate of an area.

to complex operations calling for skilled workmanship and intricate machinery. The observer learns to distinguish between industries by noticing how they differ in appearance. He sees that the textile mills of New England differ from the iron-and-steel plants of the lower Great Lakes area. The pottery towns of England are unlike the watchmaking villages of Switzerland or the glassmaking centers of Czechoslovakia.

By observing the surroundings he can sometimes find out what conditions led the people of a region to specialize in a certain industry. For instance, he sees Great Lakes iron-ore boats unloading at a Cleveland iron-and-steel mill and long trains of coal cars arriving from the mines of near-by Pennsylvania. This leads him to decide that convenient supplies of raw materials was a factor in the location of the iron-and-steel industry in Cleveland.

The world's cities differ too. Manufacturing cities differ from commercial centers, from cultural or political cities, and from ports. There are various types of each. The port of New York, with its long piers built out into the harbor waters, contrasts with the port of Los Angeles, with its man-made harbors. New Orleans, with its wharves and warehouses along the Mississippi River, differs from the Great Lakes ports.

The more striking differences in land use are soon recognized by the geography student. A keen observer also notes contrasts in methods of work, in tools and equipment, in the success with which the land is occupied, and in what is done with the produce. Through these observations, he gains insight into the people's abilities and stages of development.

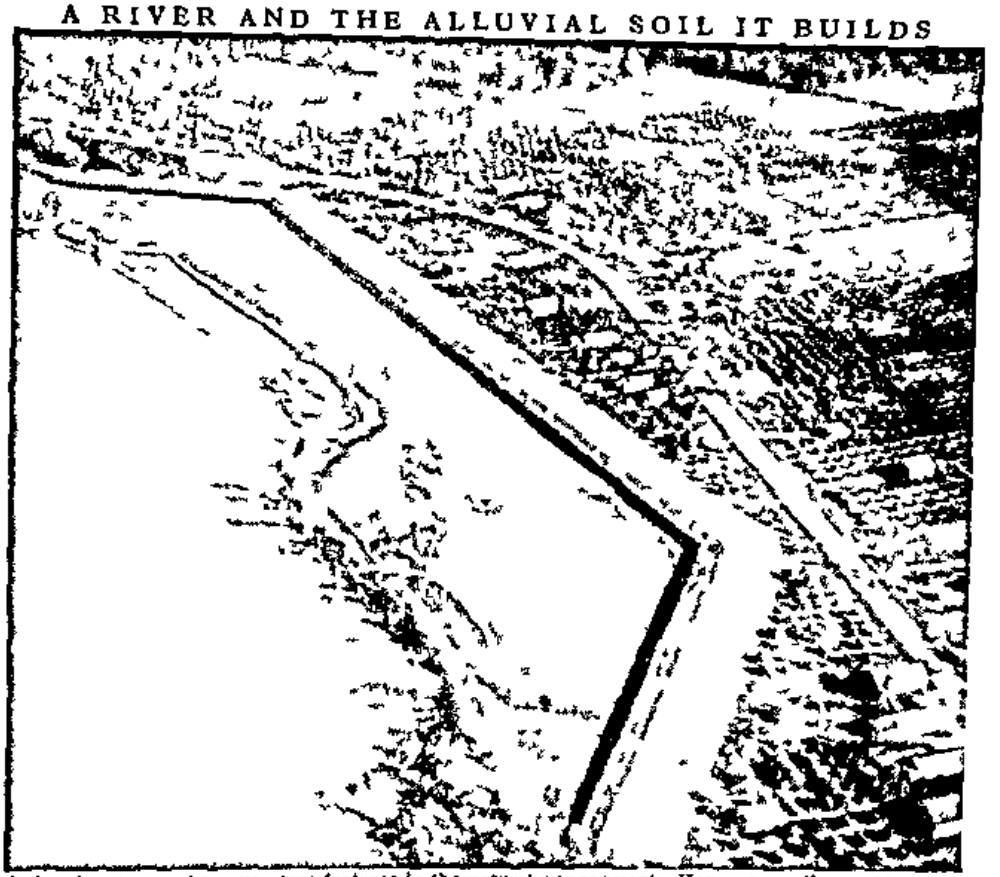
Differences due to political and social causes are usually more difficult to discern. In general, free peoples who live under a democratic government show evidence of a high standard of living and efficient use of the land. In contrast is the backwardness evident among colonial peoples, such as those of the Belgian Congo and of many Pacific islands.

Understanding the Natural Environment

THE GEOGRAPHY student-explorer observes and learns many things about the elements of the natural environment. An accurate knowledge of *location* is necessary to a correct consideration of a region. *Relative location* involves the position of one place or thing in relation to others—as the location of a city with respect to mountains, plains, waterways, railroads, highways, air lines and the like. *Exact location* is the position of a place with reference to two global orientation lines—the equator and the prime meridian (*see* Latitude and Longitude). A position 40° N. and 80° W. places the location exactly.

Exact locations tell many facts. Latitude 40° N. means that the place is 2,800 miles north of the equator, since a degree of latitude covers about 70 miles. Here June is a summer month. The days are almost 15 hours long and the noon sun appears high in the sky. December is a winter month. The days are only about 9 hours long and the noon sun is low. Longitude tells the distance around the earth and indicates time zones. Longitude 80° W. means the place is 80 degrees west of the meridian of Greenwich. Counting 53 miles to the degree, this is about 4,240 miles. It is only 7:00 A.M. here when it is noon at Greenwich.

A RIVER AND THE ALLUVIAL SOIL IT BUILDS



Soil and water are two important features in the natural environment Here we see the muddy Mississippi and beside it thriving orchards and farms on the rich deep alluvial water borne soil it has built Notice the levees constructed to keep the water from overflowing the land today

Altitude (elevation above sea level) is another factor of location The explorer may find a marker set by a government surveyor which tells the elevation of a place Or he may have a barometer or altimeter to measure the altitude (*see* Barometer) Usually he has to depend upon a map or other source for this data

The land forms, or *surface and relief* of a region are important for understanding the human activities there They also help to explain other elements of the natural environment, especially the climate In studying the land forms, the geographer notes the obvious differences between plains plateaus mountains, and valleys (*see* Earth) He also seeks to measure the irregularities within a generally flat or generally mountainous area—the steepness of the slopes or the width of a valley for instance

Climate and Its Effects

The *climate* of a region affects the land forms and the soils and accounts in large measure for the plant and animal life (*see* Climate) It also makes a difference in the ways people live The explorer can discover certain things about the climate by observing evidences of climate's work on the landscape For more accurate information he depends upon climatic records Such records may be averages of temperature precipitation, pressure humidity wind and the like over a period of many years But averages may be deceiving The student usually wants to know how hot it gets, how many months are hot (above 68° F), how many are cold (below 32° F) how much it rains, when it rains and what is the prevailing wind direction With this information he can tell for instance, whether the climate is hot and wet like that of the Amazon, or mild and rainy in winter and hot and dry in summer, like that of the Mediterranean area.

Resources of Soil and Water

Soils differ in color, texture, structure, and chemical composition from place to place (*see* Soil) The geographer identifies the types of soil in order to understand the people's use of their land In hot, wet lands, such as the tropical Congo forests he finds reddish soils known as *laterites* They are generally infertile because the heavy rain has leached away the plant food Near by he may see more fertile soils deposited by overflowing streams called alluvial soils, or he may find rich lava soil which has been erupted from volcanoes (*see* Volcanoes)

Water supply exerts a vital influence on the environment Navigable rivers and lakes such as the Great Lakes-St Lawrence system in North America and the Rhine River in Europe aid in the development of their territory Egypt with its Nile River for irrigation contrasts sharply with Libya—a desert without a Nile Cities on the Great Lakes enjoy a relatively cheap and abundant municipal water supply Other cities such as Los Angeles must spend millions bringing water to their mains The level of the underground water table varies over the earth It is readily tapped by wells in most of the United States In parts of France on the other hand the location of villages may depend upon the site at which well drillers are able to reach the unusually low water table The recreational resources of a region are augmented by the availability of lakes rivers, and seas Flood hazards may make water a scourge instead of a benefit to an area (*see also* Water)

The *ocean* influences both human activities and natural elements in the environment It affects the temperature and rainfall of surrounding lands and

plays an important rôle in transportation, foreign trade, fisheries, and other affairs of man.

Plants, Animals, and Minerals

Plant life and *animal life* vary from place to place according to the temperature, rainfall, soil, and land surface (*see* Ecology). In the tropical rain forest, the dense canopy of leaves discourages undergrowth. But insects and tree-dwelling animals such as birds and monkeys are abundant. In a savanna, luxuriant tall grass provides animal food, and scattered bushes and trees offer shade. There large grazing animals prevail. Elephants, rhinoceroses, giraffes, buffaloes, and numerous smaller animals wander over the African savanna, while lions, leopards, hyenas, and other meat eaters prey on the grazing beasts. Lumbermen, hunters, and trappers depend directly upon the natural vegetation and animal life.

Farmers gain their livelihood from plants and animals that have been domesticated. The natural growth aids them in determining which kinds of crops or livestock will flourish in a region.

Regions vary in the nature and amount of their *mineral* endowment. The presence of valuable minerals may be the most significant reason for an area's development. The exhaustion of the minerals may lead to a region's economic decay. The discovery of gold in Colorado led people to settle the state; but today only "ghost towns" are left to show where some of the early mines produced millions.

Relations of Man and Nature

As THE geographer studies differences between regions, he recognizes the relationships between the people's activities and their surroundings. He sees that the climate, land forms, water supply, minerals, and other natural elements influenced the manner in which people developed their home regions.

For instance, the cold climate and short growing season of northern Norway limit the amount and kind of farming the people can do. But the presence of the sea and rich fishing banks near by give them an opportunity to develop fisheries. The article on Norway shows how the able, hardy Norwegians have made efficient use of their resources of land and sea.

Overcoming Natural Handicaps

Though the natural environment plays an important rôle in the people's adjustments, it does not determine (control) them. The final decision belongs to the people and depends upon their abilities and assets.

Primitive people are, on the whole, sharply restricted by environment. But as men rise in the scale of civilization they find ways and means to overcome many of its limitations. Technical knowledge and skills enable them to use its resources to the fullest—mining metals and coal to manufacture needed goods, cultivating and fertilizing soil to improve the food supply, bridging streams, and draining swamps.

High mountains have usually isolated peoples and served as barriers to travel and communication. But the American people have cut through or tunneled under mountain obstacles to build railways, highways, and communication lines. Thus they helped to link the country into one united nation.

Scanty rainfall everywhere serves as a hindrance to agriculture. In many lands the people have sought to overcome this handicap with irrigation. One people, however, will merely dig ditches to bring the water of a stream to adjacent fields. Another will build a huge dam to impound flood waters of a great river and construct miles of channels to spread the waters over thousands of distant acres. Engineering ability and available capital are factors contributing to these differences.

Endowments of Skill and Resources

Human factors are thus often more significant than natural elements in a region's development. These factors include the nature of the people—their insights, their skills, and their habits; their cultural background or heritage; their education, technical and scientific attainments, capital, and economic, political, and religious systems.

Great Britain did not become a great nation merely because it was situated on an island with easy access to the sea. The people of other islands, Iceland for example, have not become world powers. Neither did other natural advantages such as coal resources or fine harbors determine the island's destiny. People with abilities, skills, insights, and initiative, who saw how to make use of the favorable aspects in the environment and to cope with the unfavorable, played a more important rôle.

Decisions reached by men rather than a specially favorable environment helped to make Akron the rubber capital of the world. Akron's location in northeastern Ohio on the old Ohio and Erie Canal was favorable for transporting coal. A good water supply was offered by near-by lakes. Other places had these advantages. In Akron, however, Benjamin F. Goodrich found men with money, which they were willing to invest in the new industry, when he moved his rubber factory west in 1868. Available capital and the early start helped in the city's growth, though steep slopes and narrow valleys of the site handicapped expansion.

Kinds of Geographic Study

A GEOGRAPHER investigates and analyzes the story which men and nature together have written on the face of the earth in either of two ways. One approach is called *systematic* geography. It keeps the entire earth in view while investigating a single element in the complex, or man-land association. Such an element might be the earth's land forms, its climates, its agricultural characteristics, or its political divisions.

The other approach is called *regional* geography. It focuses attention upon a particular unit-area of the earth—that is, a region. Within the region it investigates those man-land associations which give the region its distinctive geographic character.

Subdivisions of Systematic Geography

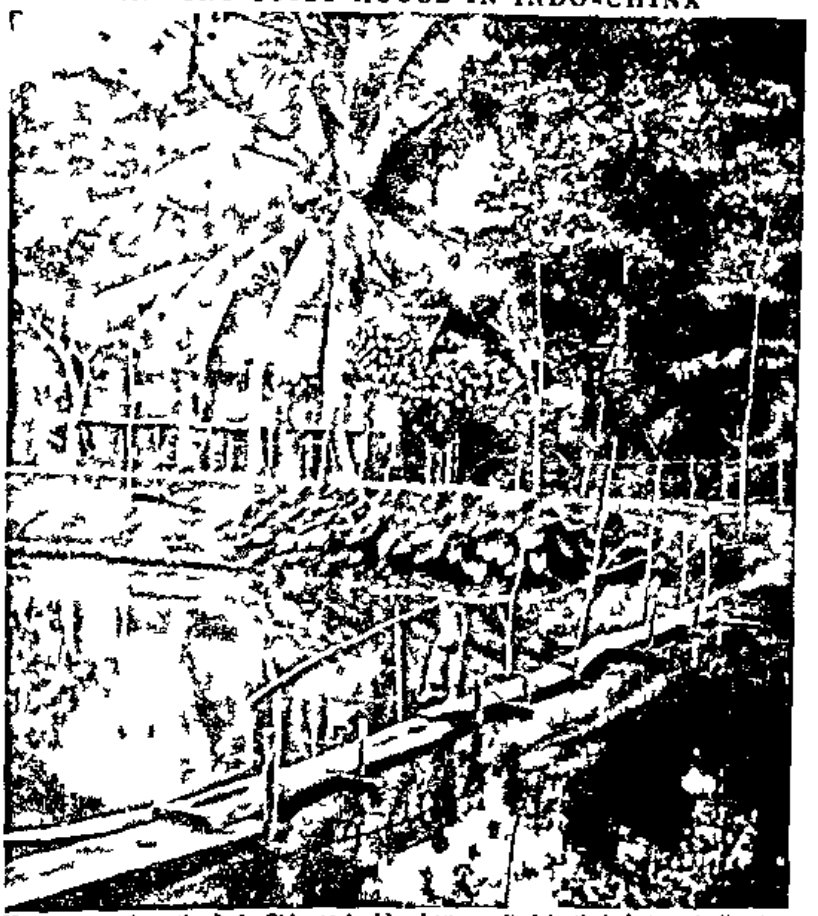
Systematic geography when focused on the natural environment brings out similarities in natural phenom-

ena between widely separated parts of the earth Analysis of the physical features of the landscape the land forms climates waters soils mineral resources and the like is called *physical geography* Certain aspects of this field in turn are sometimes studied separately as *geography of land geography of soils plant geography* and similar fields of investigation. One specialty which treats mathematically the forms size and movements of the earth is called *mathematical geography*

On the other hand systematic geography when centered on some aspect of the man made or cultural environment brings out man made similarities between faraway parts of the earth Analysis of man s occupations as they are distributed in the world is a basis for the study of *economic geography* In this field there are such specialties as *commercial geography geography of agriculture and of manufacturing*

Political geography emphasizes the pattern of the earth s political sovereignties Boundaries and their significance are one of its topics *Cultural geography* or human geography which includes various aspects of human life is another branch of *systematic geography* One of its phases is called the *geography of education* This study aims to analyze and characterize education in different parts of the world as one element or pattern in the geography of the world

AN AIRY STILT HOUSE IN INDO-CHINA



Here we see how the Indo-Chinese build a house suited to their hot wet climate They use bamboo palms and other tropical trees that grow so luxuriantly all around them. They lift the house high off the wet insect ridden ground Its wall boards are separated to let in air and the steep roof sheds the rain.

Subdivisions of Regional Geography

In regional geography analysis is concentrated on the whole man land association of *unit-areas* of varying size The unit-areas may be continental in size or subdivided into subcontinental units frequently based on political divisions such as countries states counties and the like Subdivisions of the world on the basis of similarities of human life or of a specific natural phenomenon are studied from the regional approach focusing attention on the total geographic complex (*see* World)

A specialized field of regional geographic investigation known as *urban geography* is devoted to analyzing the characteristics of cities Analysis of man land associations of the past or sequent occupance in specific unit-areas is referred to as *historical geography* In any region an investigation may be concentrated on some specific natural or cultural element as part of the whole geographic complex of that unit-area

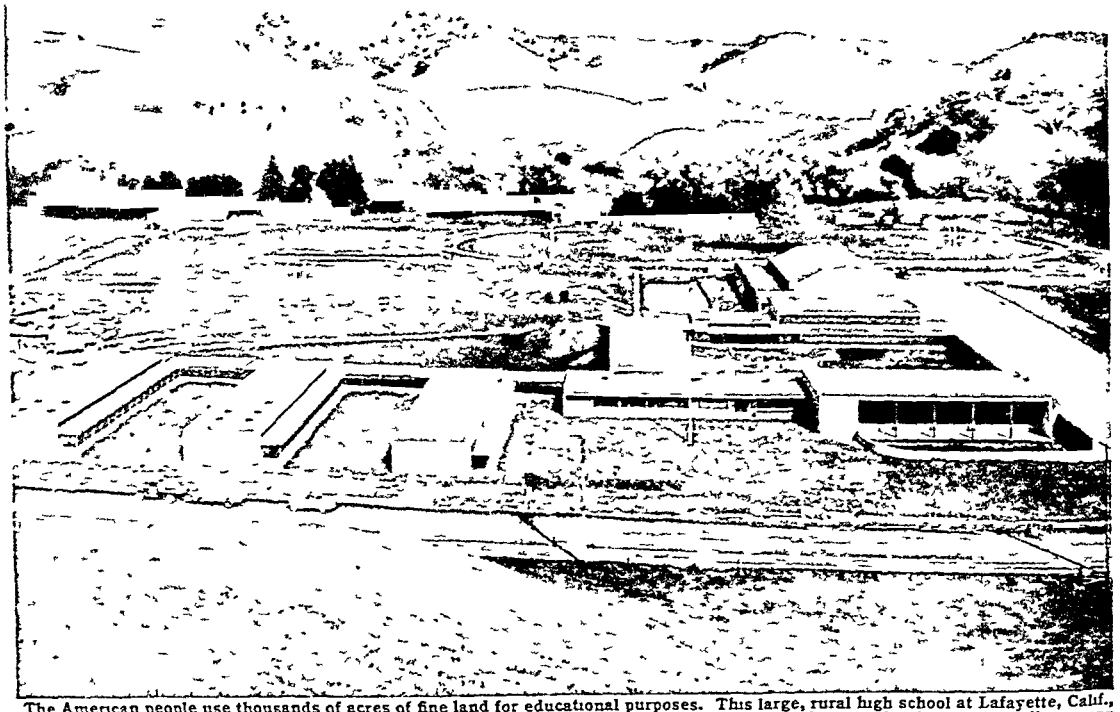
Cartography which is the recording in map language of facts of geography is on the fringe of rather than a kind of geography Similarly geographers are much concerned with the conservation of natural resources city and regional planning, and the like but these subjects cannot be listed as kinds of geography Other related sciences are climatology, meteorology, mineralogy and the like

History of Geography

PHOENICIAN traders were the first to gather geographic information on any considerable scale They left no records known to us but the ancient Greeks probably drew upon Phoenician knowledge as well as their own discoveries for making the first geographic studies which entered into the body of later knowledge

Like all early peoples the Greeks were interested largely in the odd and different aspects of other lands But their philosophers realized that the earth is round and Aristotle among others codified the knowledge of their day Eratosthenes and Hipparchus developed the use of reference circles into the forerunner of modern latitude and longitude

The Romans were interested in geographic oddities and they wanted also to know the resources of the lands they conquered About the time of Christ, Strabo supplied a mine of such information about the



The American people use thousands of acres of fine land for educational purposes. This large, rural high school at Lafayette, Calif., provides a baseball diamond and a combination track and football field, a gymnasium, workshops, and cafeteria, as well as many comfortable well-lighted classrooms.

Empire and known parts of Asia in a voluminous work. In the 2d century after Christ, Ptolemy compiled a scholarly study of the earth in a carefully prepared eight-book work (*see* Ptolemy). This book became the standard authority during the Middle Ages.

Birth of Modern Geography

Scholarly interest in geography languished during the Middle Ages, but the scientific spirit was rekindled in the Age of Discovery. The voyages of Columbus, Magellan, and others provided new understanding of the earth; and every voyage added more information about the features and peoples of faraway lands European rulers competed eagerly in sending out exploring and colonizing expeditions.

Two classes of problems faced scientists and practical mariners alike. They needed, first, to acquire accurate knowledge of the size of the earth, its figure, and the exact location of seas, capes, harbors, and the like. Second, they sought to learn about the resources of the new lands that were being opened. The seamen wanted this information because they must be able to find food, water, and good anchorages. Rulers were eager to know the possibilities for exploiting the new lands they had claimed. History sections in the articles Earth, Navigation, Longitude, and Maps trace the progress made in understanding the earth and in mapping the lands and navigating the seas during the 16th, 17th, and 18th centuries

By 1800 the outlines of the continents and islands were familiar, but three-quarters of the land area remained to be explored. During the 19th and early 20th centuries, the blank areas on the maps gradually filled. The invention of the airplane helped explorers in reaching, photographing, and mapping isolated tropical jungles and icy polar regions (*see* Exploration; Polar Exploration).

Development of Geographic Studies

Present-day methods of geographic study began to take form early in the 19th century. Scholars sought to organize the accumulated mass of knowledge about the earth and its natural and human features. They inquired into the reasons for the phenomena that had been observed and brought out relationships between the various elements.

German scholars led in this work. Karl Ritter and Alexander von Humboldt are regarded as the fathers of the modern science. Ritter, a professor of geography at the University of Berlin, worked to organize the available observations on the various areas of the earth. His special interest was the influence of land and climate on human activities and history. His material was so extensive that he was able to

cover only Africa and Asia in the 21 volumes of his work Erdkunde (Earth Science)

Humboldt was a great geographic explorer On his trips to tropical America and central Asia he brought back explanatory descriptions of little known areas that are still valuable to geographers In each area he studied the relations between different elements in the landscape—notably between plants and the climate the relief the soil the animals and human beings In his book Kosmos he sought to establish the unity of all nature

In the latter part of the 19th century a school of geographers arose in Germany and America who specialized in *physical geography* Leaders in this movement were William Morris Davis an American professor who taught in Berlin and Paris and Albrecht Penck of the University of Berlin who taught at Yale and Columbia universities In contrast to them were students of *human geography* led by Friedrich Ratzel His book Anthropogeographie studied the natural conditions of the earth in their relations to human culture His student Ellen C Semple spread his views to American geographers in her book Influences of Geographic Environment

Another trend emphasized the development of *regional geography* Two French geographers Vidal de La Blache and Jean Brunhes were influential in the regional field They urged the intensive study of small areas in order to provide a basis for the understanding of larger regions

Geography Associations and Publications

As geography departments have become increasingly important in American universities associations have been formed to encourage geographic research They include the American Geographical Society founded in 1852 which publishes the *Geographical Review* the National Geographic Society incorporated in 1888 which gives wide circulation to its *National Geographic Magazine* the Association of American Geographers founded in 1903 which publishes research papers in its *Annals* and the National Council of Geography Teachers which edits the *Journal of Geography*

Their knowledge techniques and skills have made the services of trained geographers valuable in many fields The Department of the Interior the Department of Agriculture and other agencies of the federal government have geographers on their staffs Geographers in the Department of State furnish diplomats and consuls with surveys of the foreign lands with which they deal Geographers aid with national state regional and city planning projects During the two World Wars geographers served their country in such agencies as the Army Map Service the Office of Strategic Services the Board of Geographic Names and in military and naval intelligence

REFERENCE OUTLINE FOR STUDY OF GEOGRAPHY

THE FOLLOWING outline presents material for the study of *systematic* geography under two subdivisions *physical* geography and *human* geography For detailed study of *regional* geography see the Reference-Outlines for the continents and principal countries

PHYSICAL GEOGRAPHY

I The earth as a planet E-172 P 281 size and mass E-172 rotation and revolution E-155 A 43 precession of equinoxes *A-440*

II Determining location on the earth G 42
- A Directions D 94 compass C-427 N 72 gyrocompass G 238 A 93 great circles N 76
- B Latitude and longitude *L-132-5 L-311 13*
  1 Fixing latitude N 73 77 A-436
  2 Fixing longitude N 73 77 *L-31*
- C Maps and globes M 84 kinds of maps (projections) M-84 map scales M 85 symbols M 91 91b

III Determining time T 134 L-313
- A Day and night D-24 A-429 beginning at international date line I 187
- B Dates and the calendar C-22 year and leap year Y-334-5 change at international *date line* I 187

IV Climate and weather C-348 W 77 meteorology W 77 82
- A Sun energy (solar radiation or insulation) C-349 S-450
- B Atmosphere A 73
  1 Rainfall R 02 distribution maps — world R 71 W 208 Africa *A-37* Asia *A-442* Australia A-477 Europe E-420 North America N 216 South America S-*255*
  2 Winds and storms W 150 S-403
  3 *Clouds C-359*
  4 Droughts and floods D 15 F 143
- C Climatic regions C 350 W 202 map W 207

V Seasons S-91 A-433 polar night and midnight sun A-327 changes in prevailing winds W 153 N 248

VI Land forms and their distribution E-178 180
- A The continents (maps) Africa A-38 Antarctica A 258 Asia A-411 Australia A-478 Europe E-419 North America N 245 South America S-*256*
- B Mountains M 439 E-186 G-54
  1 Africa A-36 39 45 E-198
  2 Asia A 410 414 Himalayas H-355 E-450
  3 Australia A-476
  4 Europe E-421 2 Alps A-179 S-479 Apennines A 272 Carpathians C-127 Caucasus C-155 Pyrenees P 447 Urals U-404
  5 North America N 247 C-67 C-171 M 188 U 251 Adirondacks A 21 Appalachian Highlands A 276 G-186 Cascades C-131 Ozarks O-440 Rockies R-173 U 294 Sierra Nevada S-177
  6 South America S-248 250 269-70 271 2 Andes A 244 Brazilian highlands B-287 *Guiana highlands G 222d* 223
- C Plateaus Africa A-34 S-241 Australia A-476 Asia I 222 T 127 T 213 M-341 Europe S-312 North America L-137 U 299 South America A-333 P 96
- D Coastal plains E-186 North America N 254 C-171 U 251 Europe E-414 Africa A-34

E. Continental plains: Africa A-36, 45; Asia A-414, R-257; Australia A-476; Europe E-414, 422, R-258; North America N-255, U-284, C-75; South America S-250, A-184, A-330

F. Glaciers and glaciated surfaces G-115, G-213, E-190: Ice Age I-4

VII. Water resources W-60, G-43, E-180: ground water W-62, E-181, S-357; surface water W-62

A. Rivers and important river systems R-155

1. Africa A-45: Congo C-434; Niger N-235; Nile N-237; Zambezi Z-349
2. Asia A-413, R-257: Euphrates E-413; Ganges G-9; Hwang H-454; Indus I-127; Tigris T-133; Yangtze Y-333
3. Europe E-414, 421: Danube D-15; Elbe E-288; Loire L-296; Meuse M-185, Po P-330*b*; Rhine R-133; Rhone R-146; Seine S-98; Thames T-110; Vistula V-493, Volga V-520
4. North America N-247, map U-256-7: Colorado C-414*a*; Columbia C-415*a*; Hudson H-438; Mackenzie M-15; Mississippi M-307; Missouri M-325, Niagara N-229; Ohio O-362; Peace P-102; Potomac P-392; Red River of the North R-88; Rio Grande R-155; St. Lawrence S-19; Yukon Y-348
5. South America S-250, 264: Amazon A-184; Orinoco O-424; Plata-Paraná-Uruguay P-314

B. Lakes and inland seas L-87, A-39, 45: Aral A-293; Baikal B-18; Caspian C-132; Great Lakes G-178; Great Salt Lake G-185; Hudson Bay H-437; Mediterranean M-165; Tanganyika T-10; Victoria Nyanza V-471

C. Oceans and seas O-327-36: Atlantic A-451-3; Indian I-87; Pacific P-1-11; Adriatic A-22; Aegean A-27; Baltic B-37; Bering B-125; Black B-204; Caribbean C-122; Gulf of Mexico G-228*a*; North N-298; Persian Gulf P-155; Red R-88

VIII. Vegetation and associated animal life G-44. See also the Reference-Outlines for Botany and Zoology. For detailed regional study, see the Reference-Outlines for continents and principal countries

A. Life zones (associations of plant and animal life) E-218: North America N-258-63

B. Types of plant life P-286: world distribution, map W-208; Africa, map A-37; Asia, map A-412; Australia, map A-477; Europe, map E-420; North America, map N-246; South America, map S-255

IX. Soils S-226-31: conservation C-452*e-f*

X. Minerals M-261-7. For detailed regional study, see the Reference-Outlines for continents and principal countries

A. Mineral fuels F-313-15: coal C-361; coke C-380; peat P-108; petroleum P-168

B. Metallic minerals (ores): bauxite (aluminum ore) A-182; cobalt C-372; copper C-473; gold G-131; iron I-235; lead L-141; mercury M-173; nickel N-234; platinum P-314; radium R-56; silver S-186; tin T-137; tungsten (wolfram) T-205; uranium U-405; zinc Z-351. See also names of minerals in Fact-Index

C. Rock and stone R-167-70: granite G-151; limestone L-244; marble M-92

D. Other useful minerals: asphalt A-423; clay C-339; fertilizers (mineral types) F-55, N-241; gems J-346 (see also names of gems in Fact-Index); salt S-29: sulfur S-447

HUMAN GEOGRAPHY

I. Nature of human, or cultural, geography G-44, 45

II. Population P-370-74

A. World distribution, maps W-207, P-371

B. Population by continents P-373: Africa, map A-38; Asia, map A-411; Australia, map A-478; Europe, map E-419; North America, map N-245; South America, map S-256

III. Economic and political geography G-45. See also the Reference-Outlines for principal countries

IV. How people live around the world: see the Reference-Outline for People of Many Lands

A. In a cold climate P-142*b-c*, A-326-30: Eskimos E-393-7; Lapps L-101-2

B. In hot desert lands P-142*d*, D-73-73*b*, S-14-16: Arabs A-284-90; Egyptians in an irrigated river valley E-272-7; nomads N-242-242*b*

C. In grasslands P-142*d-e*, G-168*b*-170

D. In rain forests P-142*e*: Bantu of the Congo basin C-434-434*c*; Amazon Indians A-184-6

BIBLIOGRAPHY FOR GEOGRAPHY

Books for Younger Readers

Barrows, H. H. and others. Man in His World Series (Silver, 1951).

Brindze, Ruth. Gulf Stream (Vanguard, 1945)

Evans, E. K. Why We Live Where We Live (Little, 1953).

Galt, Tom. Volcano (Scribner, 1946).

Hogben, L. T. How the World Was Explored (Lothrop, 1951).

Holling, H. C. Paddle-to-the-Sea; Minn of the Mississippi (Houghton, 1941-51).

Leaf, Munro. Geography Can Be Fun (Lippincott, 1951).

Lloyd, Trevor. Sky Highways (Houghton, 1945).

Meyer, J. S. Picture Book of the Earth (Lothrop, 1949).

Quinn, Vernon. Pageant of the Seven Seas (Lippincott, 1948).

Schneider, Herman. Everyday Weather and How It Works (McGraw, 1951).

Stull, De Forest and Hatch, R. W. Journeys through Many Lands (Allyn, 1952).

Werner, Jane. Golden Geography (Simon & Schuster, 1952).

Whipple, Gertrude and James, P. E. Using Our Earth; At Home on Our Earth; Neighbors on Our Earth (Macmillan, 1947-50).

Zim, H. S. Lightning and Thunder (Morrow, 1952).

Books for Advanced Students and Teachers

Brown, R. H. Historical Geography of the United States (Harcourt, 1948).

Carson, R. L. Sea Around Us (Oxford, 1951).

Coleman, S. N. Volcanoes, New and Old (Day, 1946).

Cotton, C. A. Landscape (Wiley, 1949).

Croneis, C. G. and Krumbein, W. C. Down to Earth (Univ. of Chicago Press, 1936).

Finch, V. C. and Trewartha, Glenn T. Elements of Geography (McGraw, 1949).

Greenhood, David. Down to Earth (Holiday, 1951).

Huntington, Ellsworth. Principles of Human Geography (Wiley, 1951).

James, P. E. and Kline, A. V. P. A Geography of Man (Ginn, 1949).

Lane, F. C. Earth's Grandest Rivers (Doubleday, 1949).

Lane, F. C. World's Great Lakes (Doubleday, 1948).

Packard, L. O. and others. Geography of the World (Macmillan, 1953).

Rand McNally & Co. World Guide (Rand McNally, 1953).

Renner, G. T. Global Geography (Crowell, 1944).

Renner, G. T. and Others. *World Economic Geography* (Crowell, 1951).

Sorenson, C. W. A World View (Silver, 1949).

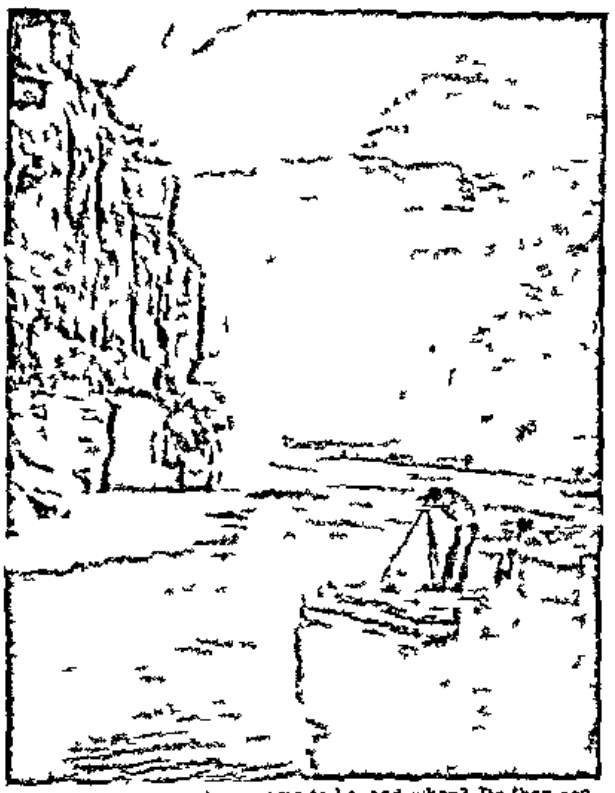
Thurston, E. L. and Faigle, E. H. World Geography (Iroquois, 1947).

White, C. L. and Renner, G. T. Human Geography (Appleton, 1948).

How GEOLOGY *Reads Earth History in* ROCKS

GEOLOGY All through the ages men have asked questions about the nature of the earth Why does it have so many kinds of rocks and why are they so different? What made the mountains and how old are they? Why are oil coal iron and gold found in some localities and not in others?

Until very recent times men could only guess at the answers Even today no one can do better with some of these questions but for most of them we can obtain answers from the science of geology



How did these mountains come to be and when? Do they contain valuable mineral? Can a dam be built safely here? For answers we go to the geologist

Beginnings of the Earth s Story

Geologists tell us for example that the earth started as a huge globe of white-hot gas flung out from the sun and spinning in space Immediately the globe started to cool and a solid crust formed over the surface The hot interior however kept shattering this crust with convulsions and explosions The explosions threw out gases and steam and these became the atmosphere and the waters of the earth Meantime as the materials in the crust and in the depths continued to cool they formed into the array of minerals and rocks which we find in the earth today

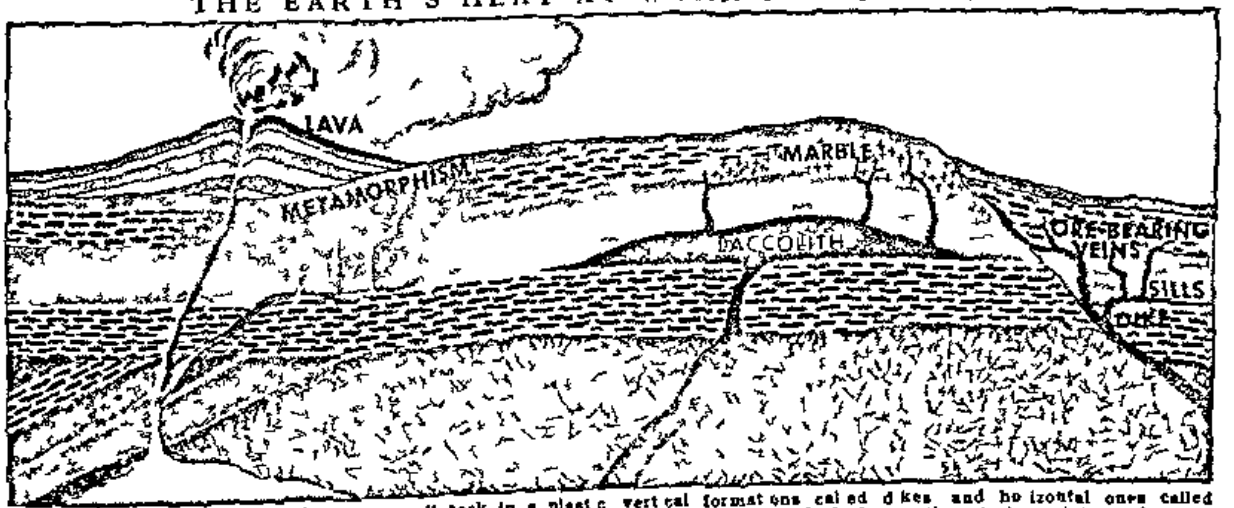
This much of the earth s history is largely theory because no one really knows how so tremendous a mass of hot gas would cool But after the crust became cool and solid the rocks in it were subjected to forces which we do understand and by the formations of the rocks geologists can trace fairly well what happened

Remolding the Crust with Heat and Fire

Many traceable changes were made by the same force (called igneous activity) which first shaped the earth intense heat in the depths below the crust How this force works can be seen in an active volcano

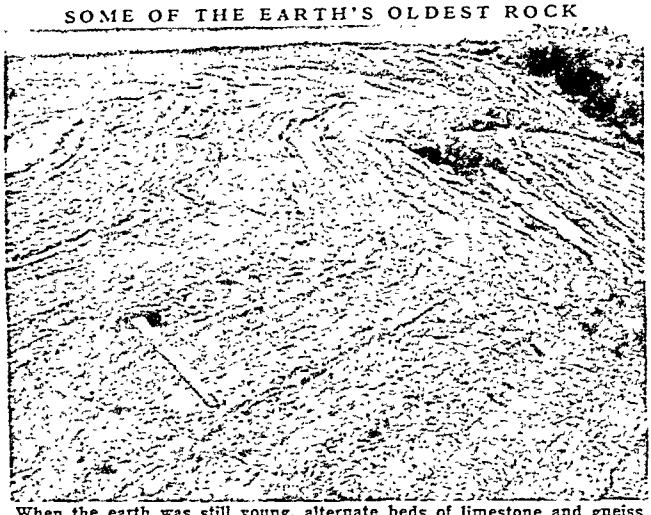
Smoke and steam pour from the crater adding gases to the atmosphere and water (when the steam condenses) to the seas and lakes Ashes stream out settle somewhere and contribute to the soil Perhaps red hot lava pours out rolls down a slope and cools into rock In the depths around the volcano molten rock works between layers in the older formations and cools into new

THE EARTH S HEAT AT WORK IN THE CRUST



Below the crust tremendous heat keeps all rock in a plastic state called magma Whenever the crust cracks magma swells up forming a volcano (left above and perhaps overflowing as lava Some magma may intrude as well between deeper layers of the crust When a volcano becomes extinct right all intruded magma cools into deposits of igneous rock including vertical formations called dikes and horizontal ones called sills A deposit which forces the crust up into a dome is called a laccolith If the intruded rock contains metal it constitutes an ore Also heat from intruded magma transforms adjacent sedi rock into metamorphic forms For example heat and water together may change limestone into marble

SOME OF THE EARTH'S OLDEST ROCK



When the earth was still young, alternate beds of limestone and gneiss were laid down in Ontario, Canada. Intense heat and pressure metamorphosed the beds into the banded, dense rock called schist which we see here. This rock has resisted change through the long ages.

deposits of igneous rock. (The word igneous is from the Latin *ignis*, meaning "fire.")

Interior heat also produces changes without breaking through. At times it causes parts of the crust to bend upward, somewhat like a bubble forming on a boiling liquid. At other times it melts away some of the lower crust, letting the surface sink. Occasionally, under stress from these movements, the crust wrinkles or breaks. The wrinkles constitute mountain ranges. The breaks cause shocks which we call earthquakes, and these may change the face of the land.

Tearing Down and Building Up

While igneous activity reworks the crust from below, the atmosphere and the waters of the earth attack it from above, tearing down material from the higher places and depositing it at lower levels.

The process of tearing down, called *weathering* or *erosion*, can be seen actively at work in most mountain valleys. Rain and perhaps snow and ice wear away the rocks. Winds hurl grit and dust at the mountains, wearing away more material. And water and wind together dissolve many kinds of rock.

In time all these processes, working together, tear down the tallest mountains, and the worn-away material is carried by streams and rivers to lower levels. The streams and rivers also contribute to the work of destruction by cutting at their banks. Even flat fields can be worn down or cut with gullies and stream beds when heavy rains fall and when the melted snow and ice of winter flow away. (*See also* Soil.)

How Flowing Water Builds Land

Streams and rivers can build up, however, as well as tear down. When streams flow down mountains or other steep slopes, they can carry with them mud and sand, and even roll pebbles and boulders along. When the slopes become gentler and the rush of water slows down, the heavier materials drop to the bottom. When the water enters the ocean, contact with salt water precipitates the finest material, called silt. The deposit may form a delta, or ocean currents may carry the material far and wide over the ocean bottom.

Eventually all mountains are worn down, their material is deposited on the lowlands or carried out to sea, and not enough slope is left anywhere to produce active currents of water. This flat state is called a *peneplain;* and it lasts until some disturbance deep within the earth lifts up a portion of the region, and the whole process starts again.

The Work of Living Organisms

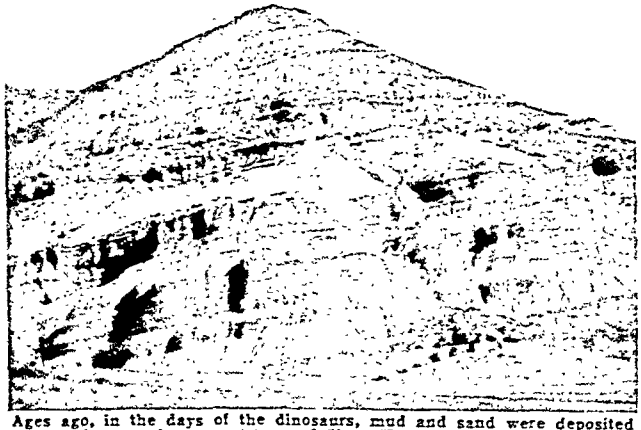
All these changes are the work of lifeless forces; but from the instant life appeared on the earth living creatures contributed their share. Bacteria and later lowly lichens and mosses grew on rocks and broke them down into soil. When higher plants appeared they caused similar changes. In some places swamp-dwelling plants were buried and became deposits of coal. Elsewhere, animal remains formed petroleum.

The greatest contributions were made, however, by the tiny shell animals which lived wherever shallow seas spread over low parts of continents. As countless billions of the creatures died in these seas, their remains fell to the bottom and formed limy ooze. This gradually hardened into rock.

Sedimentary and Metamorphic Rock

During times of deposition, immense amounts of material accumulate in low spots, and the lower portions gradually are transformed into rock by pressure of the mass above. Sand becomes sandstone; gravel is pressed and cemented into rock called con-

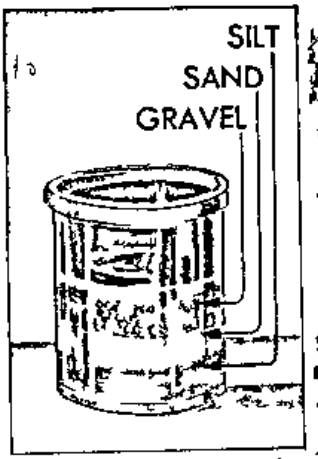
SEDIMENTARY ROCKS LIE LAYER UPON LAYER



Ages ago, in the days of the dinosaurs, mud and sand were deposited alternately near the present town of Cisco, Utah. These sediments hardened into the layers of shale and sandstone shown here.

HOW SEDIMENTATION LAYS MATERIAL IN LAYERS





To illust ate one esult of sed men a on shake m xed g a e sand and d t n water The la gest pa es ome to the op and the sma est go to the bo tom Th s a so an be seen at the bo om of moun a n pools (r gh whe e fa ng wa e shakes up he ma e a



A QUIET STREAM BUILDS ITS BED



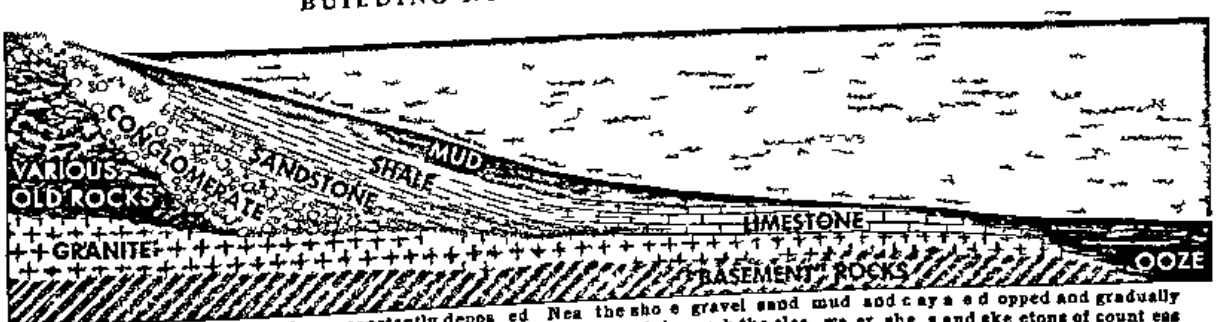
When cos se and ght mate als a e ca ed down a qu e s eam o ve he hea es cos sest ma e a se es to the bo om first and the finest ghtest material las The esul ng deposits a e shown above

FORMATION OF A DELTA AT A RIVER MOUTH



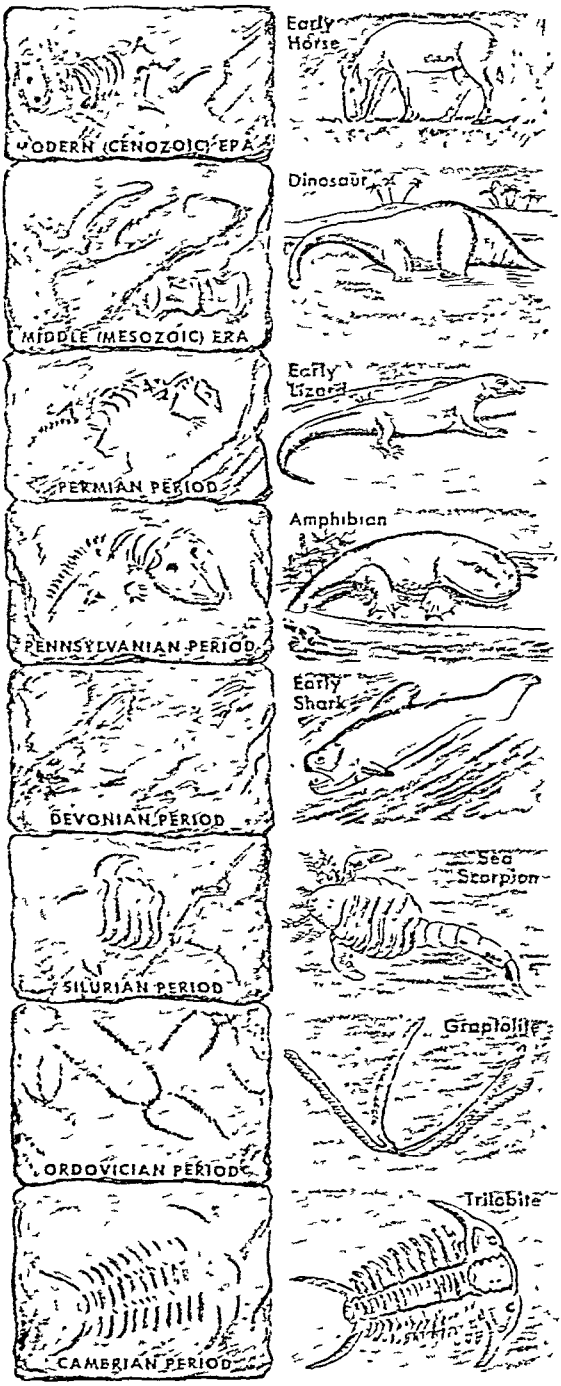
Rive s may ca y silt suspended n water fo hund eds of miles But when they rea h the o ean con act w th salt wa er causes mos of the s to p ec p ate and fo m a fan shaped depos called a de ta

BUILDING ROCK ON THE OCEAN BOTTOM



Even n the ocean mate als a e constantly depos ed Nea the sho e gravel sand mud and c ay a e d opped and gradually fo m rocks called conglome ate sandstone and sha e Farther out benea h the clea wa er she s and ske etons of count ess tiny sea animals fo m limestone Benea h the g ea est dep hs the bo tom is composed of ooze o soft c ay

HOW FOSSILS TELL GEOLOGIC TIME



At the left are illustrated rock layers of eight different ages. They are arranged as they normally occur—the newest at the top and the oldest at the bottom. In each layer is the fossil of some animal (shown alive at the right) which lived only at the particular time in earth history when that layer was formed. Hence the presence of any one of these fossils in a rock reveals its geologic age. The six lower formations shown here belong to the era of Ancient, or Paleozoic, life

glomerate. Mud is transformed into shale. Limy ooze becomes limestone or chalk.

Such rocks are called *sedimentary*, because most of them were formed from sediments. Some rocks are altered, however, after deposition, by contact with lava or other hot igneous rock, by material deposited from water, or by extra pressure. Limestone may become marble, for example, and shale may become slate. Such altered rocks are called *metamorphic*. (*See also* Minerals, Rock)

The Keys of Geologic History

Throughout the ages these various processes have laid down deposits of rock and worn them away, and warped and twisted them, until today the array of rocks often seems a baffling jumble. But usually the rocks contain clues which tell well enough what happened

First is the nature of the rock itself. Rocks such as granite and basalt are marks of igneous activity. They always well up from below into cracks and openings in the crust. Sandstone, shale, and conglomerate are the remains of some near-by mountain range that has been worn down. Limestone indicates that the region where it lies was once under the sea.

Such clues do not tell, however, *when* a rock was formed. To determine this the geologist uses the "rule of layers" and clues provided by fossils.

What the Rule of Layers Tells

The rule is simple. New deposits are laid upon older ones; hence in most arrays of rocks the oldest are at the bottom and the youngest at the top. Warping of the earth's crust may have overturned a series of layers, but the overturn leaves signs which tell what happened.

For any single region, the rule of layers works well. But it seldom helps in comparing one region with another, for the same layers cannot be traced to both. For example, rocks in North America cannot be matched in time with those in Europe or Africa. To meet this difficulty, geologists turn to fossils.

How Fossils Give a Yardstick of Time

Fossils are immensely helpful because of their very nature. A fossil is made when rocky material replaces the remains of some animal or plant, particle by particle. This makes an imperishable mold in stone of the original; and the mold endures through the ages, ready to tell its story whenever it is dug up (*see* Fossils).

The most helpful fossils are those of creatures which lived only a short time in geologic history. When fossils of such a short-lived species are found in different localities, the rocks which contain them probably were laid down at about the same time. Such fossils enable geologists to correlate rocks even from different continents, and thereby bring together the geologic history of the entire earth.

Advancement in Knowledge of Geology

The simple principles given above provide the foundation for all geology. Of course, in advanced studies, help is needed from other sciences Many rocks cannot be identified exactly without chemical and phys-

ical tests Again theories about the origin of the earth are based largely upon knowledge obtained through astronomy and physics

But geology still has a vast field of its own which offers careers that combine study discovery and outdoor activity While rocks fossils and similar material must often be studied in a laboratory, much geological work is done in the field and a geologist's life can often be as adventurous as that of an explorer A geologist who prospects for oils or metals for example may go to the farthest and wildest places of the world

Even those who do not follow geology as a career will find their lives enriched by some knowledge of its principles It will give new interest to every landscape they behold When they climb a mountain they will know when and how it was made When they see an area of flat rock they will be able to picture the scene long ages ago when it was laid down The entire world and every scene in it will have richer meaning when geology has taught them how to understand what lies before them

DATING A FORMATION



The fossils on the opposite page tell the geologic age of the rocks shown here A comparison will show also that several of the old periods are not represented by deposits

Vocational Opportunities

Most of those who make geology a profession find employment in one of these three fields

1 Work on the faculties of colleges universities and technical schools

2 Work on state and national geological surveys

3 Work for petroleum and mining companies

The largest single group is employed by the United States Geological Survey Qualified men are appointed under civil service regulations They study the mineral resources of the nation and also prepare topographical maps of the national area Most states support similar activities Another large group is employed by the United States Bureau of Mines

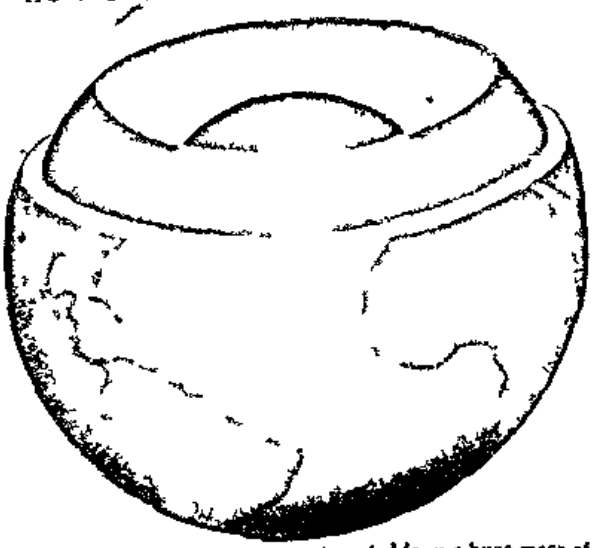
Aside from the work provided by petroleum and mining companies private industry uses geologists to aid in selecting sites for dams tunnels bridges and other heavy structures and in providing water supplies

Some Important Principles of Geology

SINCE geology is the science of the earth a knowledge of the earth itself is the basis of all else in this field The first thing to grasp is the fact that the earth's crust is formed in layers

Geologists believe that two-thirds or more of the earth consists of a core which resembles highly compressed nickel and iron in density and elasticity Around this core is a thick intermediate layer of heavy igneous rock then comes the outer crust from 20 to 30 miles thick In this outer crust lie all the known sedimentary rocks such as limestone and sand stone but the deposits of these rocks form only thin patches near the surface The rest of the crust is composed of lighter kinds of igneous rocks such as granite The core is sometimes called the Nife zone (from the first parts of the two words nickel and *ferrum* for iron) the intermediate layer is called the Sima zone (from silica and magnesium) and the crust is called the Sial zone (from silica and aluminum) The average densities compared to water are the core 12 0 the intermediate layer 4 3 the outer crust 2 75

HOW THE EARTH COOLED IN LAYERS



Geologists believe that as the earth cooled from a huge mass of white-hot gas heavy material formed a central core, while lighter rock formed a thick intermediate layer and the lightest rock became a thin crust.

Layers of Cool and Molten Rock

The outer crust as we know is cool and rigid The intermediate zone and the central core however, are in a hot plastic state called *magma* Magma is hot enough to be molten and fluid if it were not confined but the weight which presses upon it from above keeps it as hard as steel It can creep however like cold molasses from beneath regions which acquire extra weight into locations which bear less weight, and it can flow through an open channel like the vent of a volcano

The fact that the outer crust "floats," so to speak, upon hot, plastic magma provides an explanation for many of the changes in the face of the earth through the ages. At times the changes occurred on a world-wide scale and constituted a geological revolution. But much more frequently they have taken place here and there in single regions.

How the Shrinking Core Causes Revolutions

From time to time in the earth's history, the entire crust seems to have shrunk, like the skin on a drying apple. In doing so it formed in various places around the world gigantic "wrinkles" which we call mountain ranges. This action can be explained by saying that the magma of the interior is losing heat slowly and contracting. But the crust, because it is solid and stiff, does not shrink gradually in keeping with the magma. It tends to hold its shape until the contraction of the underlying core has materially weakened support below. Then the crust collapses, and adjusts itself to fit the interior.

Most of these adjustments have been gradual and have not caused the world-wide disasters that otherwise would have been inevitable. The crust collapsed bit by bit, not all at once, over periods of thousands of years. A few feet, and even a few inches, a century were probably the usual rates of change.

Geologists believe that we are still living in the period of mountain building which has produced the Rockies, the Sierras, the Andes, the Alps, the Caucasus, the Himalayas, and the other high ranges of the earth. In some of them the uplift is by no means finished. Yet the occasional outbreak of a volcano or of an earthquake is all we notice of the change that is being wrought.

Changes by Isostatic Adjustment

Lesser changes occur when weight is shifted from place to place in the crust by igneous intrusions, erosion, and deposition. The crust and the magma underneath respond with a slow adjustment. Newly accumulated excess weight squeezes out underlying magma toward every side; and the magma forces up surrounding lighter portions of the crust until the total weight of crust and magma is equal throughout the region. This state of equilibrium is called *isostasy* (from two Greek words meaning "equal status"). Once it is attained, no further change occurs until erosion, the formation of glaciers, or upheavals due to a world-wide revolution upsets the balance.

How the crust adjusts itself to the play of all these forces depends upon the strength of the rock in various regions. In certain areas called *shields* or *coigns* the rock was turned by heat and pressure into exceptionally strong formations and these have resisted change down the ages. When geologic revolutions have taken place, it was the weaker rocks around them that had to give way. The greatest of all such formations, called the Laurentian shield, lies under eastern Canada. Others are shown in the accompanying picture.

AGE-OLD "ANCHORS" OF THE CRUST



The spots of orange mark shields (coigns) of hard rock which formed in the earliest days. Continents and seas have come and gone around them (as suggested by orange strips and bars on the blue sea); but the shields have endured without change.

The bottoms of the great ocean deeps also seem exceptionally resistant. Perhaps it is because they lie below the level where the lighter rocks of the outer crust occur. Under the layers of ooze lies hard rock resembling that of the earth's intermediate layers.

Adjustment of the Crust by Warping

Strong rock formations may respond to stress, however, by bending up or down. This happened, for example, around the Great Lakes during the Ice Age. When the glaciers formed, the tremendous weight of ice bent down the crust and squeezed out magma from underneath, forcing up adjoining parts of the crust. But as the ice melted away, the parts that had been forced up now became the heavier and squeezed the magma back, letting the Great Lakes region up again. This rise still continues at the rate of two feet a century in Canada, even though the glaciers disappeared thousands of years ago.

Warping may also take place on the edges of a continent, causing wide changes in the coast line, and at times admitting the sea far into the interior. This has happened several times to the area which is now the Mississippi Valley. When the crust sank the ocean came in, overflowing the sites where Chicago and St. Louis now stand. When the land rose again the water drained away.

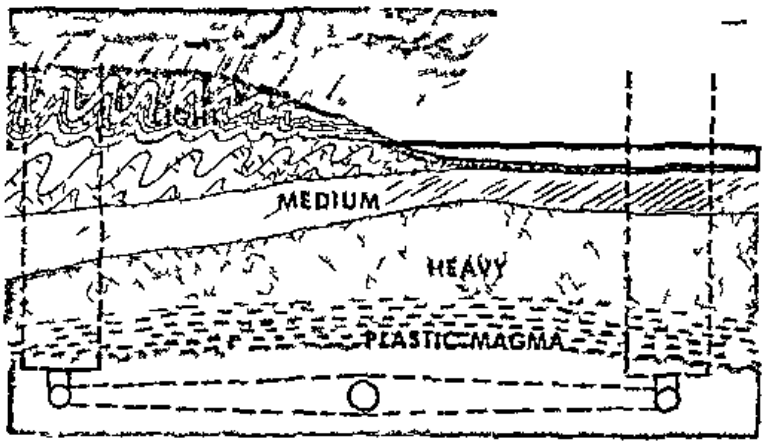
Adjustment by Breaking and Folding

Where the crust contains much weak material, such as thick deposits of sedimentary rock, it may break instead of bending. The line where the break takes place is called a *fault*. If the crust is also forced together horizontally, as happens in times of shrinkage, one edge of the fault may be forced over the other, forming an *overthrust*. Again, various layers

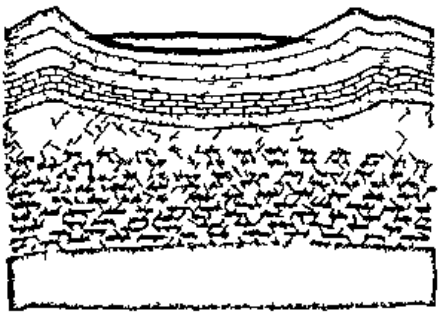
HOW MOUNTAIN RANGES ARE BORN AND DIE

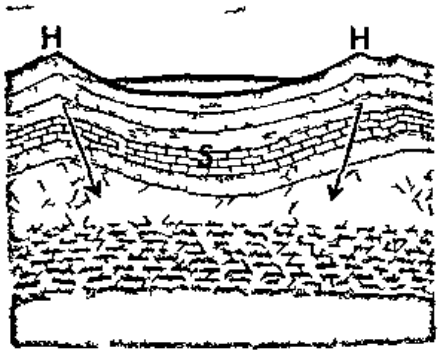


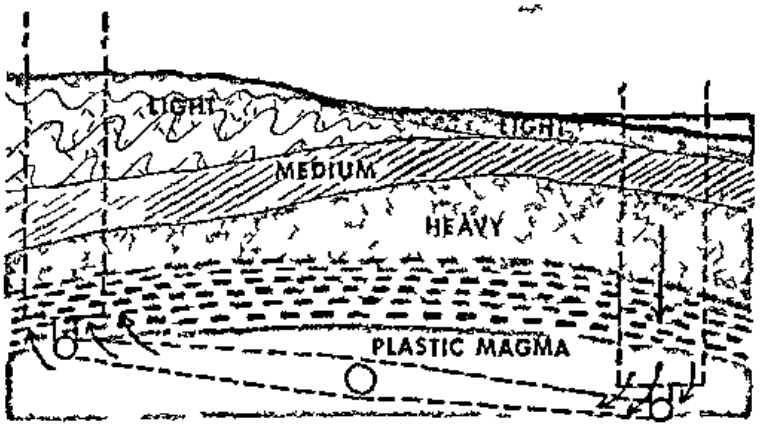
Geologists bel eve that the ea th s crust must shrink and wrinkle l ke the sk n of a dry ng apple as the core s owly cools and con rac s The "wrinkles appear to us as great mountain ranges



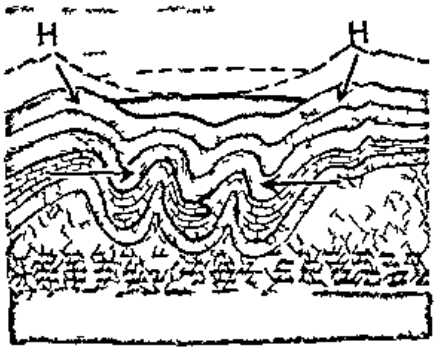
After the earth s crust has been readjusted by the process shown at the left the mate als of the earth a e n balance New y folded sed mentary rocks a e lighter than the hard ro ks of the ancho s or sh e ds but they a so stand higher and so have equal we ght This cond t on is ind cated by two dotted co umns po s ed n ba ance on a beam scale



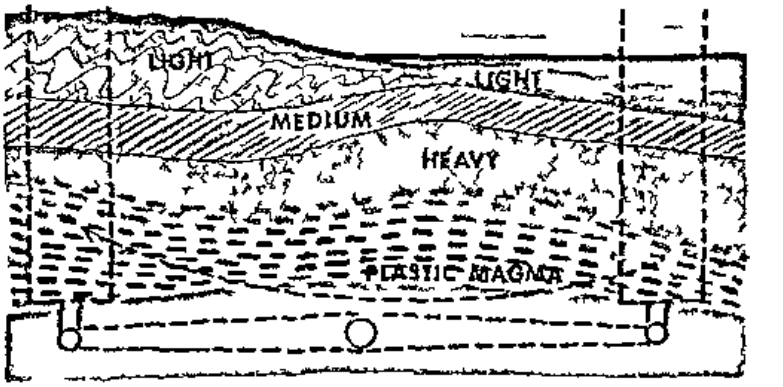




Immed ate y a new mountain range is created however wind and ra n sta t carry ng mate al f om t th ough the air and the r ve s to the sea Th s shift of mater al dest oys the ba ance between the mounta n a ea and the sea a ea as nd cated by the t ted beam beneath the two columns Thereupon the dif ference is co rected by the p o ess shown below

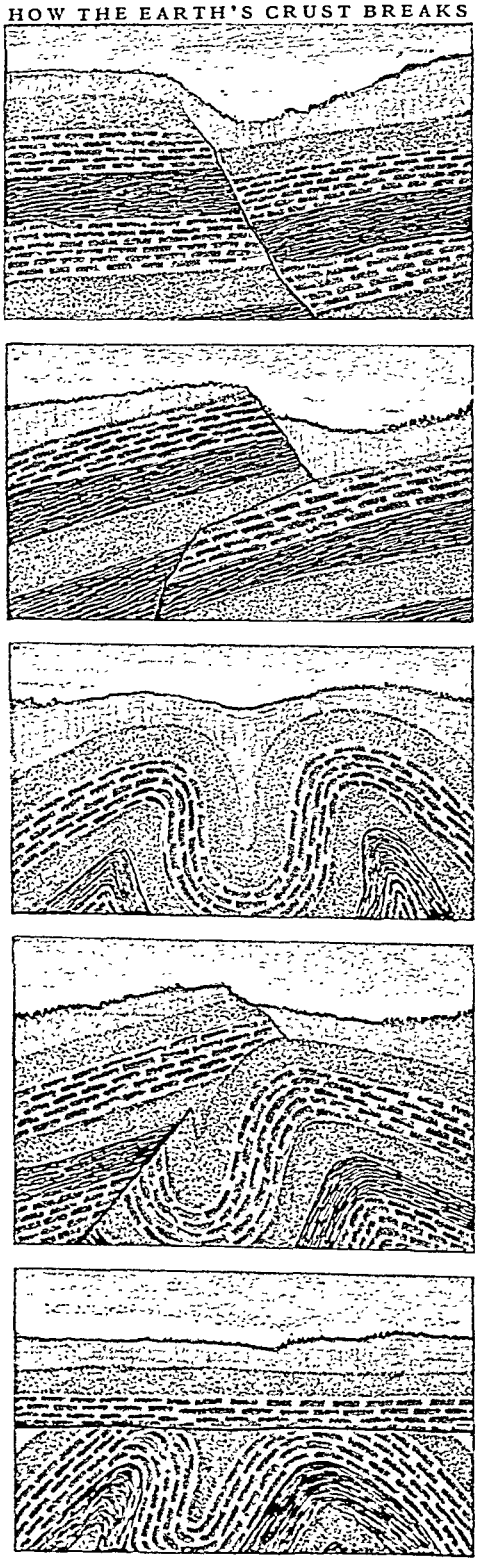


As the cent al core of the earth cont acts it draws down hot magma weakening the sup po t of the c ust (top and m dd e Even tually the crust must sh ink down to 5t (bottom) Regions of hard ro k (H) fall in toward the center and come c oser togethe horizonta y Th s crushes the ntervening softer rock (S) into folds or w ink es



Here the g eater weight (right) has sunk into the magma and the magma has relieved the ert a p essu e by fo c ng up the l ghter mate a (left) unt l the two *masses are again in balance* This is called *iso a c ad ustment* The resto ed ele vat on causes new eros on and may cause a repet t on of all the events shown

HOW THE EARTH'S CRUST BREAKS



may be squeezed into folds, without breaking. If a fold points upward, like an arch, it is called an *anticline.* If it turns downward, forming a trough, it is called a *syncline.* Some large synclines, scores or hundreds of miles across, are formed when sediments from great mountain ranges bend down the crust. These are called *geosynclines.*

Geologic Events and the March of Life

The various revolutions in the geologic record are important not only in the history of the earth itself, but in the development of life. During times of stability between the revolutions, living conditions were easy on the level land. No high mountains existed to deflect rain-bearing winds and thereby create deserts (*see* Winds). Widespread oceans maintained warmth almost everywhere; even the polar regions had reasonably genial weather. There was little in the environment to force changes among plants or animals.

During the periods of revolution and mountain making, however, living conditions over much of the world grew harsh. Many regions became semiarid or complete deserts, because the new mountains deprived them of rain. The polar regions and many mountain ranges were glaciated. Many kinds of plants and animals could not endure the new environment and perished; only those survived which could adapt themselves to the changes. The great alterations in the forms of life on the earth can be correlated, therefore, with these periods as explained in more detail later in this article.

Names of Eras Reflect Changes in Life

Because the revolutions were so important in the development of living things much of the story of geology is organized around them, just as we organize human history around outstanding events such as the fall of Rome, the Crusades, or the discovery of America.

The largest divisions of geologic time are called *eras.* Each era begins (roughly) with a world-wide revolution, and the names reflect the development which life attained because of it. Each name ends in *zoic,* from the Greek word *zoe* for "life." The first part of the name reflects the stage of development. For example, the name for the first era, Archeozoic, means "primitive life" from *archaios,* "ancient."

Each era is subdivided into periods, and each period into *epochs.* Although changes occurred in life in each of these divisions, they were not so profound as those from era to era; so geologists name many of the subdivisions for localities where the rocks of the subdivision were first recognized and studied, as told in the table. Others were named for outstanding characteristics. For example, European geologists call the time when the world's greatest coal deposits were laid down the Carboniferous period. (American geologists, however, consider this as two periods, called the Mississippian and Pennsylvanian.)

In the modern or Cenozoic era, the subdivision names again reflect the development of life. This era is not really a full era, but only the beginning of one. Geologists consider that it is still in its first period, called also the Cenozoic, and subdivide it into epochs only. These are named according

Here are various ways in which the earth's crust may break or wrinkle. From top to bottom they are: a simple break, or fault; a fault and overthrust; a fold; a fold which has been altered by later fault and overthrust; a fold, with top eroded, and later deposits on top. The line where the strata do not lie evenly, one above another, is called an unconformity.

to a scheme proposed by the English geologist Lyell in 1833, and the names all end in "cene" (*from the* Greek *kainos*, "recent") *The first part of* each name indicates what proportion of present-day animals and plants were in existence in the epoch

An older system of names, based upon a d*vision of* geologic time into four parts, used *the term* Tertiary for all but the last two epochs of the Cenozoic period (the Pleistocene and the Holocene) These were called Quaternary t*me* The Pleistocene is often called the Ice Age because it was the time of extensive glaciation

The rock strata which correspond to the lesser divisions in time are called systems, *series*, and formations A *system* consists of the rocks formed *during one period* —for example, the Cenozoic system A *series* contains all the rocks of an epoch—for example, the Eocene A *formation* is a subdivision within an *epoch*

The *significance* and value of these names will become more apparent as we review the *outstanding events* in *these divisions of* geologic time

The Immense Span of Geologic Time

The first outstanding feature of geologic history is the fact that our earth seems to be exceedingly old Astronomers have estimated that the solar system of which earth is part was formed about 3 billion years ago Estimates based on the decomposition of uranium indicate that many rocks range from 1 2 to 2 2 billion years in age A later method announced in 1952, gives figures as great as 3 5 billion years Since the rocks used in these estimates were not the first ones to form upon our planet scientists conclude that the earth must be very ancient

Archeozoic and Proterozoic Beginnings

More than half of this immense span of time was spent in 'beginnings'—the solidification of the earth and the beginnings of life Geologists divide this time with many uncertainties between the Archeozoic (also called Archean) and Proterozoic eras Fossil algae in some of the rocks formed in those remote times prove that life had begun

Proterozoic rocks contain clear evidence of life —fossil algae, worm tracks and burrows limestone, and the black shales and graphitic slate which probably obtained their carbon from plant remains Life must have been better developed, however, than these early traces would indicate, because highly developed forms appear at the beginning of the next era, but probably the creatures concerned were soft bodied and did not form fossils Also, igneous activity is believed to have destroyed much of the evidence

The earth was still young in these times and the crust was *still being shattered* by volcanic explosions and massive intrusions of magma between its layers of sedimentary rock Many of the huge intrusions, called *batholiths* (from *bathos*, "depth" and *lithos*, "stone"), were scores of miles across Other intrusions forced thin layers of granite between sediments then, repeated foldings compressed and hardened the mixture into *schist* (This name is applied to any rock which has a banded or layer structure Banded or schistose igneous rock, usually granite, is called *gneiss*)

These massive intrusions brought to the *surface* abundant mineral wealth, particularly iron, copper gold, silver, nickel and radium The great iron deposits near Lake Superior consist of material which was leached out of early intrusive deposits Rocks of both these eras lie at or near the surface in the 'shield' regions of the earth, and are exposed in various deep gashes, such as the bottom of the Grand Canyon in Arizona

Flourishing Life of the Paleozoic Era

In contrast to the scanty record of life in the early eras the record suddenly becomes rich at the very start of the next era, the Paleozoic This may have happened because the first period of the era

CHAPTERS OF EARTH HISTORY

Archeozoic Era

Began more than 2 billion years ago lasted more than 800 million years four divisions KEEWATIN LAURENTIAN TIMIS KAMIYO ALGOMAN named from districts in Canada

Proterozoic Era

Began about 1 ,00 million years ago lasted 700 million years two divisions HURONIAN (ALGONKIAN) and KEWEENAWAN

Paleozoic Era

Began 490 million years ago lasted 300 million years The periods with durations in millions of years follow

CAMBRIAN (30)—from Latin name Cambria (Wales)
ORDOVICIAN (60)—from Latin Ordovices (a Welsh tribe)
SILURIAN (30)—from Latin Silures (a Welsh tribe)
DEVONIAN (40)—from Devonshire England
MISSISSIPPIAN (30)—in Europe Lower Carboniferous
PENNSYLVANIAN (30)—in Europe Upper Carboniferous
PERMIAN (30)—from region of Perm Russia

Mesozoic Era

Began 190 million years ago lasted 130 million years. The periods with durations in millions of years follow

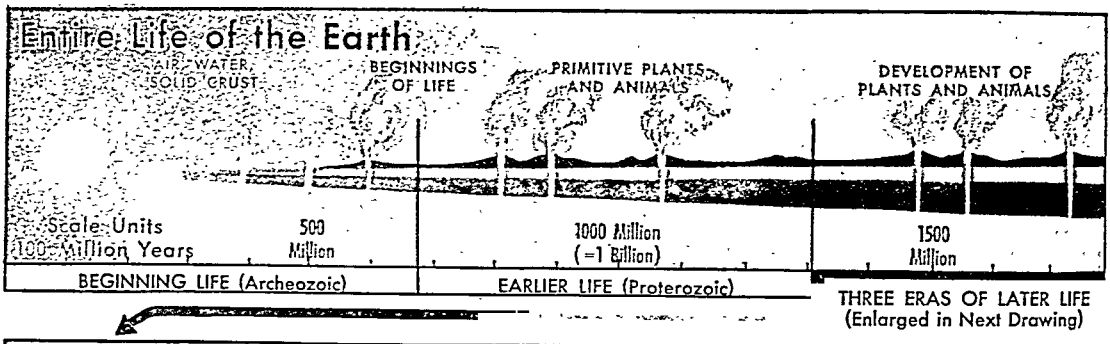
TRIASSIC (35)—from three divisions of the period
JURASSIC (40)—from Jura Mts France Switzerland
CRETACEOUS (55)—from Latin *creta* meaning chalk

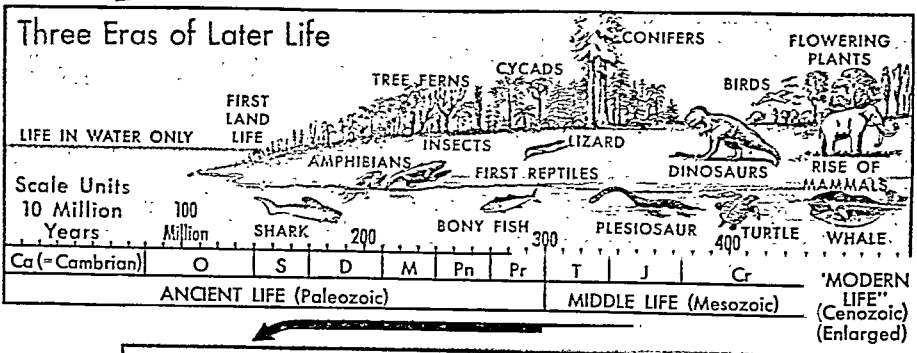
Cenozoic Era

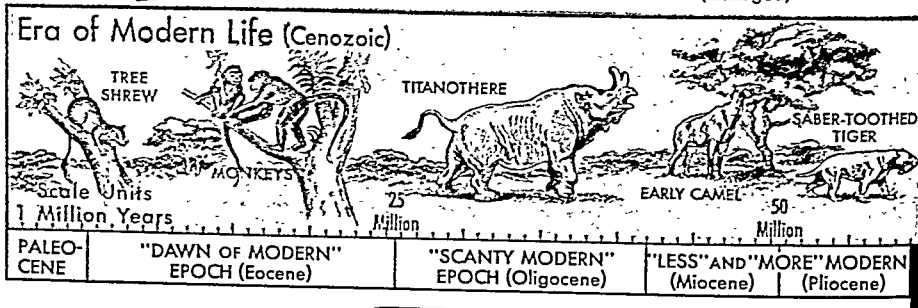
Began 60 million years ago still in first period which is also called CENOZOIC Epochs with durations in millions of years follow

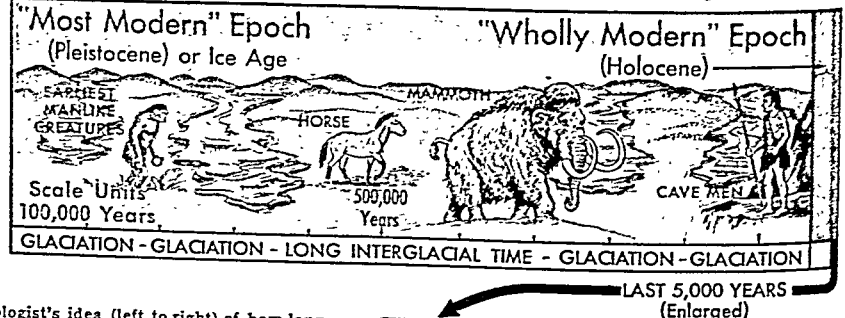
PALEOCENE (5)—from Greek *palaios* ancient, and *kainos* recent
EOCENE (20)—from *eos* dawn
OLIGOCENE (16)—from *oligos* scanty
MIOCENE (9)—from *meion* less
PLIOCENE (9)—from *pleion* more
PLEISTOCENE (1 or 2)—from *pleistos* most
HOLOCENE (13 000 to 40 000 years)—from *holos* entire

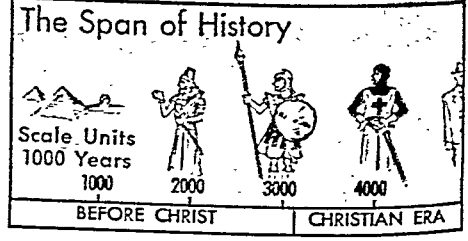
GEOLOGY'S TIME SCALE FOR EARTH HISTORY











The top picture shows the geologist's idea (left to right) of how long the earth has existed. Man's time on earth is too short to show on this scale. It will not show even when the last three divisions are expanded in the second drawing on a scale ten times larger. To illustrate it, two more tenfold enlargements are needed, first to show the Modern Era, and then the "Most Modern" and "Wholly Modern" epochs. This gives a time scale a thousand times larger than in the first pictures. Even now, the thin segment at the extreme right in the fourth picture must be enlarged a hundred times to show historic times. (In the second picture, letters indicate periods as follows: Ca, Cambrian, O, Ordovician; S, Silurian; D, Devonian; M, Mississippian; Pn, Pennsylvanian; Pr, Permian; T, Triassic; J, Jurassic; Cr, Cretaceous.)

the Cambrian, saw much of the earth submerged and the widespread seas contained shell bearing creatures which formed fossils readily Almost every class of marine life except vertebrates was present—microscopic protozoans, sponges, jellyfish, worms, mollusks brachiopods (lamp shells), and trilobites (*see* Trilobite) But there is no clear evidence of any Cambrian life, plant or animal, on land

From the start of the period, North America had a shape which persisted throughout the Paleozoic era The continent was bordered, east and west, by two huge mountain ranges, Appalachia and Cascadia The first extended from about the eastern edge of the present Appalachians well out into the Atlantic the other occupied the site of the Sierras and Cascades Inside these ranges lay a giant H of huge geosynclines or depressions, which admitted the sea whenever the continent subsided The crossbar of the H ran roughly from Montana and Wyoming to Ohio, Kentucky, and Tennessee Sediments from the mountain ranges, alternating with deposits from the seas, gathered in the eastern and western geosynclines, and provided the rocks which later became the Appalachians and the Rockies

The next two periods (Ordovician and Silurian) were similar In the Ordovician, corals appeared and cartilaginous ancestors of fishes, as well as curious jellyfish that looked like seaweed, the graptolites The Silurian saw the advent of crinoids, or sea lilies and eurypterids, or sea scorpions Some developed air breathing organs and became land scorpions Land plants are suggested by doubtful fragments of stems and leaves

During the Ordovician, North America underwent its maximum submergence of all time *During the* height of it, only the coastal ranges, part of the Canadian shield, and various islands were above water Four of these islands, formed where the crust warped up into gentle domes, have persisted as the Ozarks, the Wisconsin highlands, the Adirondacks, and a gentle rise across Ohio and Kentucky called the Cincinnati arch *The period also gave* North America the oil and gas of Texas, Oklahoma, Ohio, and Pennsylvania, the limestone which became the marble of Vermont and Tennessee, and the slate deposits in Pennsylvania, Vermont, New York, and Virginia

The Silurian was geologically quiet in North America, but in the North Atlantic a local disturbance, called the Caledonian, threw up a horseshoe of mountains with one tip in northern Greenland, another in northern Ireland and an arch between them running across Scotland, Scandinavia, and Spitsbergen Remnants of these mountains still persist *The Silurian* contributed the iron ore in Alabama, and salt deposits in New York

Vertebrates in the "Age of Fishes"

The next period, the Devonian, was notable for a rapid extension of plant life, scorpions, spiders, and primitive insects on the land, and emergence of animals with backbones (vertebrates) in the sea The first of these were sharks, with cartilaginous skeletons, but true bony fish also appeared Many of these, like the mudfish of today, could breathe air for an extended time (*see* Mudfish), and geologists believe that some of these air-breathing fish became the first land vertebrates

In Devonian times many areas including old Appalachia in North America, were uplifted, and material eroded from them produced vast stretches of sand and mud near sea level Over many of these flats, heavy rains alternated with dry spells The mudfish could endure such conditions because they could breathe air if caught on land during a dry spell Eventually, in one strain, the fins are believed to have developed into crude legs, and these were the first amphibians, the parent stock of all other land vertebrates (*see* Salamander)

The Coal Age and the End of an Era

Conditions remained much as in Devonian times in the next period (Mississippian or Lower Carboniferous) Then came the Pennsylvanian period (or Upper Carboniferous) when great coal deposits were laid down Swampy flats and a warm, humid climate produced huge forests of tree ferns As the ferns died, the remains were preserved by the swamp water Gradually, this vegetation became coal (*see* Coal)

During this period, insects attained their greatest size, some dragonflies had wings nearly a yard across Amphibians flourished, and some began to lay eggs on land *These were the first reptiles*

The earth also began to undergo one of its world-wide revolutions, with considerable mountain making Remnants of the mountains include the Appalachians and the belt of ranges across Europe from Wales to Czechoslovakia Mountain making increased in the *next period, the Permian It brought an end to the* generally genial Paleozoic era Glaciers and deserts made living conditions hard, and only the most efficient types of plants and animals survived to give rise to the life of the next era, the Mesozoic

"Transition Life" of the Mesozoic Era

The Mesozoic era contains three periods—Triassic, Jurassic, and Cretaceous In their course the Permian mountains and the continents generally were worn down During the Cretaceous period at the end of the era, shallow seas covered more of the continents than at any other time These seas left vast deposits of chalk, for which the period is named

During these three periods, reptiles dominated the earth From the start of the era, giant dinosaurs stalked the land, other reptiles (plesiosaurs and ichthyosaurs) lived in the sea In Jurassic time, still others, the pterosaurs took to the air But even during this reign of the reptiles the life of modern times got a start A sort of "feathered flying reptile" called *Archeopteryx* appeared in Jurassic times, foreshadowing modern birds In the same period the first mammals appeared

In plant life the Paleozoic tree ferns had given way to cycads, ginkgos, and primitive conifers of Triassic time Modern flowering plants including grasses and trees, may have started in the Jurassic

period; they became abundant in the Cretaceous. Then came the start of another world-wide revolution and with it the dawn of modern times.

The Beginning of the Modern Era

In North America, the change to modern times began late in the Cretaceous with the *Laramide revolution*—a tremendous squeeze between the hard rock of the Pacific basin and the great "anchor" of the Laurentian shield which folded up less resistant intervening areas. It created the ancestors of the Rocky Mountains, drained the swamps, and cut off the lush food supply of the great plant-eating dinosaurs, thereby helping to extinguish these monsters and many other reptiles. Thus the world was ready for the new mammals to develop and flourish.

Similar revolutions elsewhere, at various times during the era, raised the Andes of South America, the Alps, the Pyrenees, the Carpathians, and the Caucasus in Europe. Some of the first ranges to be thrown up, such as the Rockies, were later worn down and still later raised again. Rapid erosion cut away the softer deposits, leaving the harder rocks standing out in bold relief. The whole depth of the Grand Canyon was carved out in this time. Older mountains, such as the Appalachians, were again elevated and new valleys and peaks were cut by their rejuvenated streams.

From one to two million years ago, an unexplained change of climate brought a widespread Ice Age (*see* Ice Age). The last wave of ice began melting from perhaps 40,000 to 13,000 years ago, depending upon the locality. As it receded, the world and its natural life took on the appearance we know today.

Measuring Geologic Time

Geologists determine the age of rocks and their fossils in several ways. One long-established method is based upon the radioactive decay of uranium in unweathered deposits. Half of any amount of uranium turns into lead and helium in about 4.5 billion years. Comparison of the actual amounts of these substances in a sample therefore gives its age. A more recent method uses tiny amounts of rubidium, strontium, and other elements, as well as uranium. This method can be applied to common rocks such as granite, which was formed during many periods.

In the 1940's, W. F. Libby and James Arnold began to use radioactive carbon 14 (an isotope of ordinary carbon 12) to date deposits of late glacial and postglacial times. Plants and animals absorb this isotope, but when they die it begins to decay at a regular rate. The age of substances such as bone and wood can be determined from the ratio between carbon 12 and the carbon 14 remaining in them.

GEOMETRY—*Science of* SPACE RELATIONS

GEOMETRY. When we lay out a baseball diamond, we use methods from the science of geometry. Builders and engineers apply geometric principles in designing huge buildings, bridges, and roads. Methods based upon geometry help aviators to find their way across the oceans and astronomers to plot the stars. The very name "geometry" suggests connection with the measurement and study of space. It comes from the Greek terms *geo-*, meaning "earth," and *metria*, meaning "measuring."

Our common names for many familiar objects come from geometry. Among them are angle, circle, cube, and sphere. Others are given in a diagram on the facing page. Geometry, however, has much more than this to offer. This science is a great aid to other sciences. Help from geometry enabled Kepler to solve the age-old riddle of planetary motion and to prove that the earth goes around the sun. Today advanced knowledge gained from geometry helps scientists in probing outer space and in suggesting what might lie beyond our galaxy of stars.

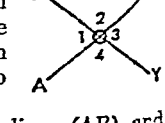
How Geometry Attacks Its Problems

Geometry also provides a powerful means for organizing and analyzing data in any scientific investigation and for testing the truth of the conclusions reached. This consists of adapting the method which geometry has developed for solving its own problems by reasoning step by step from the beginning to the end of a problem. Geometry does not "guess" or use reasoning that "may be right" or "partly right." Engineers could not use that kind of basic help in designing a jet plane or a huge power dam. Geometry develops answers which are precise. If the data for the reasoning are correct, then the conclusion reached *must* be right. This method of reasoning is called *geometric proof*.

Geometers have found that among all the properties of objects in space a certain small number are so obvious as to need no proof. The geometric method of reasoning begins with these self-evident facts. An example is the statement, "Things which are equal to the same thing are equal to each other." A test for selecting such facts can be stated thus: "This statement seems so basically true, it is hard to imagine the situation being otherwise." One such test is the famous one still used today which was made by the Alexandrian geometer Euclid in the 3d century B.C. An example will show how it is used.

How "Line" and "Point" Establish "Angle"

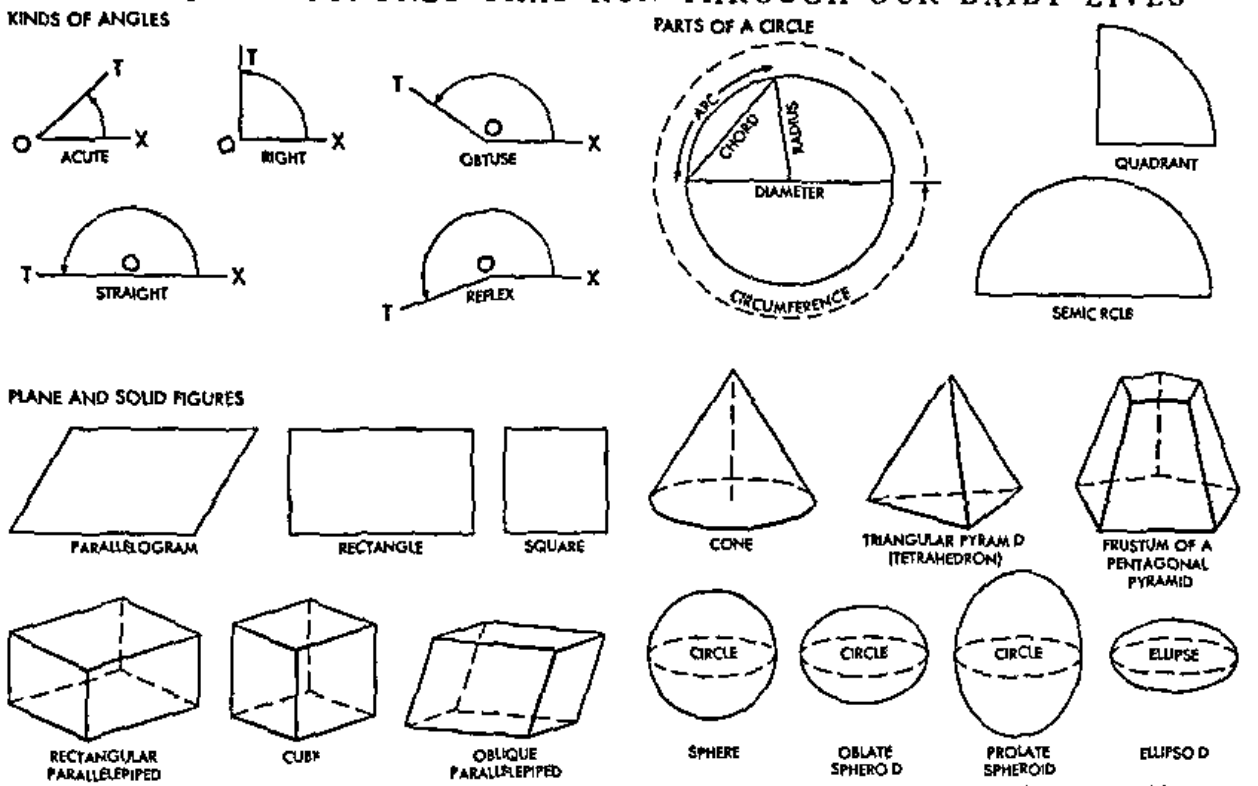
Everyone has a good idea of what is meant by a "point" and by a "straight line." They are examples of what can be accepted without proof. Geometry therefore accepts these as *undefined terms*. Everyone also has some idea of what is meant by an "angle." In the case of an angle, however, it is desirable to have a precise definition. It can be given in terms of points and lines in two steps:



1. Intersection: If two straight lines (AB) and (XY) have only one point (O) in common, they are said to *intersect*.

2. Angles: Where the straight lines intersect they form *angles* (marked 1, 2, 3, and 4 in the dia-

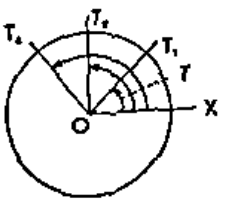
GEOMETRIC FIGURES THAT RUN THROUGH OUR DAILY LIVES



These diagrams show shapes and objects that are found throughout our buildings, machines, and other structures Such geometric shapes provide the basis for designing everything that men build and for many studies in engineering and science

gram) These angles can be written in terms of the lines and point as (1) angle AOX, (2) angle XOB, (3) angle BOY, and (4) angle YOA Thus the angles are defined precisely

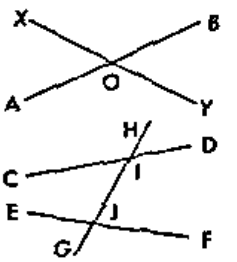
It is necessary also to provide a means for *measuring* any angle This can be done by supposing an angle to be generated ("made") by *rotation* If a point (O) is selected and two lines (OX) and (OT) are drawn from it, the resulting figure is called an angle The point (O) is called the *vertex* of the angle and the lines OX and OT are called the *sides* If now the line OT is thought of as the hand of a clock being turned counter-clockwise, then the angle may be thought of as the amount that line (OT) must turn to go from position OX to positions OT_1 OT_2 OT_3, and so on The amount of turn can be measured in degrees or any other suitable unit



To "name" an angle, the vertex letter is placed between the two letters found at the extremities of the sides (and an angle sign $\angle$ may be used), thus $\angle XOT$ A *right* angle is formed when one side of the angle is rotated through one *fourth* of a complete revolution, or 90° ($\angle XOT_2$)

Using Angles to Test Other Propositions

These definitions of angles can be used to test various important relations between *sets of lines* First, however, certain relations between the angles and the sets of lines must be stated in terms that are convenient for use Definitions for the important relations between sets of lines are as follows



Vertical angles If two lines intersect, then the angles AOY and BOX are called vertical angles They are angles that have a common vertex and respective sides that lie in two straight lines (AB) and (XY)

Transversal If two lines are cut by a third line the third line is said to be a transversal of the first two lines In the diagram, GH is a transversal of lines CD and EF

Alternate-interior angles If two lines are cut by a transversal, the angles CIG and HJF are called alternate-interior angles The angles EJH and DIG are also alternate-interior angles

Corresponding angles If two lines are cut by a transversal at any angle, then the angles EJH and CIH (and also the angles FJH and DIH) are called corresponding angles

Parallel lines It is now possible to state an extremely important definition It is this If two lines are cut by a transversal so that the alternate-interior angles are equal the lines are parallel

This definition is a very important one in the study of geometry From Euclid's time until a comparatively recent date it was thought that it was necessary to have parallel lines in geometry These

lines were "imagined" to be capable of extension to infinity without ever meeting. However, in the 19th century the mathematician Riemann developed a "closed space" geometry, like that on a sphere, in which there are no parallel lines. This can easily be visualized if the great circles on the sphere are called lines. Lobachevsky, a famous Russian mathematician, developed a geometry in which there are many lines parallel to a given line.

The geometries of Riemann and Lobachevsky are called non-Euclidean geometries. Einstein used these ideas in developing his theory of relativity (*see* Relativity).

Working Propositions Called "Postulates"

The preceding examples show how geometry uses accepted propositions on which to build others. We started with two ideas—points and lines—which were accepted as undefined terms without proof. Geometry must also have certain "working propositions" called *postulates*, because without them we could not reason further. We must accept certain ones among them without proof, because it is impossible to prove all statements in geometry. For the purpose of this article, the following propositions are accepted as postulates:

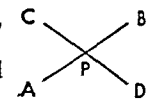
1. Two straight lines can intersect in only one point.
2. Through a given point not on a given line, one line can be drawn through the point parallel to the given line. (This is a form of the famous parallel postulate of Euclid. Riemann did not use this postulate.)
3. All straight angles (those whose sides and vertex lie on a straight line) are equal.
4. If two equal angles have a common vertex and one common side, and the remaining side of each angle lies on the same side of the common side, then the remaining sides must coincide.
5. Equals subtracted from equals leave equals.
6. The whole is equal to the sum of its parts.
7. Equals may be substituted for equals in any statement of equality.

The Nature of a Geometric Theorem

We all know that in many cases in everyday life, if certain facts are true or come true, certain conclusions must follow. In geometry, likewise, certain statements follow logically from the accepted postulates, defined terms, and undefined terms. These derived statements are called *theorems.*

Theorems are generally stated in an "if-then" form, consisting of two parts: (1) the "if" part, called the *hypothesis;* and (2) the "then" part, called the *conclusion.* The "if" part, or hypothesis, is sometimes called the "given" part. The steps leading from the hypothesis which finally justify the conclusion are called the *argument,* or *proof.* Anything stated in the hypothesis may be used in the argument without citing any proof, since such statements are taken as true for the sake of the argument. The methods of working out proofs can be illustrated by proving a few theorems.

Theorem 1. If two lines intersect, the vertical angles are equal.



Hypothesis: Any two lines (AB) and (CD) intersect at (P).

Conclusion: $\angle APC = \angle DPB$. (This is the part of the theorem which must be proved, to follow logically from the hypothesis and the postulates.)

Argument:

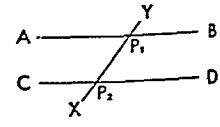
1. $\angle APB = \angle CPD$ — *Reason:* all straight angles are equal.
2. $\angle APC + \angle CPB = \angle APB$ — *Reason:* postulate 6.
3. $\angle CPB + \angle BPD = \angle CPD$ — *Reason:* postulate 6.
4. $\angle APC + \angle CPB = \angle CPB + \angle BPD$ — *Reason:* postulate 7.
5. $\angle APC = \angle BPD$ — *Reason:* postulate 5. (Subtract $\angle CPB$ from each side of the equation in step 4.)

Thus it has been proven that vertical angles are equal. In the proof, each statement is supported by some previously accepted statement, and the final one follows as a result of the proper combination of the previous statements. This is an example of a *deductive proof* in geometry.

How Theorems Lead to Other Theorems

An important feature of geometry is the fact that a theorem, once proved, can be used to prove other theorems. No part of it need ever be proved again. This fact will appear in the next theorem.

Theorem 2. If two lines are parallel and are cut by a transversal, then the corresponding angles made by the transversal are equal. (Note: in the earlier definition of corresponding angles, it did not matter whether the lines were parallel. It mattered only that the angles stood in corresponding positions relative to the lines. Now parallelism is introduced, and a consequence of this addition is to be proved.)



Hypothesis: Any two parallel lines (AB) and (CD) and any transversal (XY) are given.

Conclusion: $\angle YP_1B = \angle YP_2D$.

Argument:

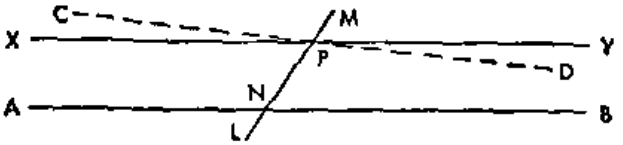
1. $\angle DP_2Y = \angle AP_1X$. *Reason:* alternate-interior angles are equal by the definition given of parallel lines.
2. $\angle BP_1Y = \angle AP_1X$. *Reason:* vertical angles are equal by theorem 1. (This is an example of using a previously established theorem in the course of proving another theorem.)
3. $\angle YP_1B = \angle YP_2D$. *Reason:* postulate 7.

The Use of Indirect Proof

Another aspect of theorems is proof by the *indirect* method. Theorem 3 is an example. This example will also show that a postulate cannot be taken to mean more than it says. For example, postulate 2 justifies drawing a line parallel to a given line through a point not on the line. But the postulate does *not* say that only *one line* can be drawn through the point parallel to the other line. Before this statement can be accepted as true,

geometry demands that it be proved This proof can be developed as follows

Theorem 3 *If a line and a point not on the line are given, then one, and only one,* line can be drawn through the point parallel to the given line



Hypothesis Any line (AB) and any point (P) not on AB are given

Conclusion One, and only one line can be drawn through P parallel to AB

Argument

1 One line (XY) can be drawn through P parallel to AB *Reason* postulate 2

2 Following this there are only two possible situations, as follows

a Only one line can be drawn through P parallel to AB or

b It is possible to draw more than one line through P which will be parallel to AB

3 Assume that outcome (b) is possible Let such a line be CD Draw any transversal (LM) through point P

4 LM will intersect AB in one point (N) *Reason* postulate 1

5 $\angle BNP = \angle NPC$ *Reason* CD is assumed parallel to AB Therefore by definition of parallel lines, these angles must be equal

6 $\angle BNP = \angle NPX$ *Reason* line XY is parallel to CD By definition these angles must be equal

7 Hence $\angle NPC = \angle NPX$ *Reason* postulate 7

8 Therefore line PC coincides with line PX, that is lines XY and CD must be the same line *Reason* postulate 4

9 Hence it is impossible to draw more than one line through P parallel to AB

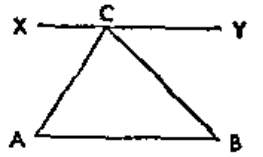
This theorem was proved by the indirect method Note that the only two possibilities were listed it is possible to draw *only one line* that satisfies the given conditions, or it is possible to draw *more than one line* The second outcome was proved to be impossible Therefore the first possibility (*only one line*) has to be the correct one

(This method of proof is often *called by the Latin* phrase *reductio ad absurdum*—meaning "reduction to an absurdity" In other words, *the alternatives to* the theorem being proved are shown to be impossible Another commonly used *Latin "tag" of* this sort consists of the letters Q E D They stand for the Latin phrase, *quod erat demonstrandum, meaning* "that *which was to be demonstrated*" In older times scribes often wrote *QED at the end of* a geometric proof Hence today the letters are often used to indicate the end of an unanswerable argument)

An Important Theorem about Triangles

The following example is built upon postulates and accepted facts about a straight angle It yields a conclusion which is among the most fundamental properties of triangles

Theorem 4 In a triangle (ABC) the sum of its interior angles (those inside the triangle) is equal to a straight angle (180°)



Hypothesis Any triangle (ABC) is given

Conclusion The sum of $\angle ABC + \angle BCA + \angle CAB$ = a straight angle

Argument

1 Through C draw a line (XY) parallel to AB (This can be done under postulate 2)

2 $\angle XCY$ is a straight angle *Reason* definition of a straight angle

3 $\angle XCA + \angle ACB + \angle BCY = XCY$ = a straight angle *Reason* postulate 6

4 $\angle BAC = \angle ACX$ and $\angle BCY = \angle CBA$ *Reason* definition of parallel lines by equal alternate-interior angles

5 $\angle BAC + \angle ACB + \angle ABC$ = a straight angle *Reason* postulate 7

6 Hence the sum of the interior angles of a triangle equals a straight angle

All these examples together show the careful, "step-by-step" way in which geometry works from known or accepted facts to prove that other propositions must be true beyond the possibility of question or doubt

Nature of Converse Theorems

The "if then" parts of some theorems may be interchanged Other theorems do not allow this For example the statement that if two lines are parallel, then the corresponding angles are equal is a true theorem Interchanging the hypothesis and the conclusion gives this statement if the corresponding angles are equal then the lines are parallel This is also a true theorem

If a new statement is made by interchanging the hypothesis and conclusion, it is called the *converse* of the original statement A theorem (statement) and its converse are not always both true For example if a quadrilateral (four-sided figure) is a rectangle, it is a parallelogram (opposite sides parallel) The converse is not true A parallelogram is not necessarily a rectangle

Contrapositive Theorems

If the hypothesis and conclusion are both denied (*by stating* in the *negative*) and then interchanged, the result is true if the original theorem was true The *result from* these steps is a *contrapositive* theorem To illustrate it is a true theorem that if two angles are right angles then they are equal New theorem if two angles are *not* equal, then they are *not* both right angles This is also true

It can be shown that a theorem and its contrapositive are always both true or both false Thus, suppose the theorem if $A \neq B$ then $C = D$ is true The contrapositive (if $C = D$ then $A \neq B$) can also be proved

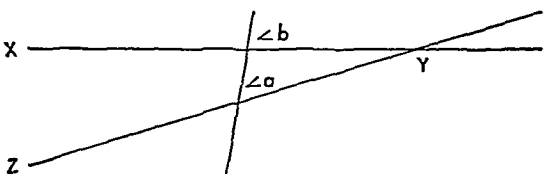
1 Either $A = B$ or $A \neq B$ *Reason* things are either equal or not equal ($\neq$ means "not equal to")

2. If A=B then C=D *Reason:* the original theorem, assumed true.
3. But C≠D *Reason:* hypothesis.
4. Hence C=D and C≠D *Reason:* combining statements 2 and 3.
5. This is impossible, so A≠B *Reason:* as given in statement 1.

This is a *reductio ad absurdum* proof.

Proving Theorems with the Contrapositive

Theorem. If two intersecting lines are cut by a transversal, the corresponding angles are unequal.



Hypothesis: Lines ZY and XY intersect at Y.
To be proved: $\angle a \neq \angle b$ ($\angle a$ *is not* equal to $\angle b$.)
Argument:

1. $\angle a$ is less than $\angle b$ *Reason:* the exterior angle ($\angle b$) of a triangle is greater than either opposite interior angle.
2. $\angle a \neq \angle b$ *Reason:* by statement 1.

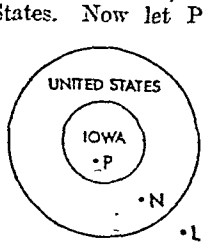
This proves the theorem. Now take the contrapositive of this theorem, with this result: If the corresponding angles are equal then the two lines which are cut by a transversal will not intersect. This last theorem is the equivalent of one of the theorems previously proven about parallel lines.

Inverse Theorems and Eulerian Diagrams

If the hypothesis and conclusion of the theorem are denied but not interchanged, then a new theorem results which is called the *inverse of the original theorem.* A theorem and its inverse are not always both true. Both the inverse and the converse, however, are always *both* true or *both* false.

A famous Swiss mathematician, Leonhard Euler, showed how to remember the relations between a theorem, its contrapositive, its inverse, and its converse. For an illustration of Euler's method (called Eulerian diagrams) consider this statement: If Mr Smith lives in Iowa, then he lives in the United States. This is, of course, a true statement.

Now draw a circle for Iowa and around it, a larger circle for the United States. Now let P represent the place where Mr. Smith lives; and check the statement about his residence. It is obviously true, because the point P is in both circles.



The converse of the statement is: If Mr. Smith lives in the United States, then he lives in Iowa. This statement cannot be accepted as true without further facts or proof, because Mr. Smith might be living at point N.

The contrapositive of the statement is: If Mr. Smith does not live in the United States, he must be living at a point such as L outside the United States. Therefore it cannot be in Iowa.

The inverse of the statement is: If Mr. Smith does not live in Iowa, then he does not live in the United States. This statement could be false. Mr. Smith might be living at a point such as N.

With the aid of the Eulerian diagram and the illustrations given above, it is now possible to pair a given theorem and its three derivative theorems in the following manner:

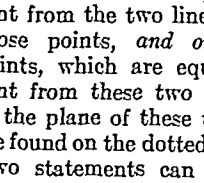
The Theorem and Its Contrapositive	Are always both true or both false.
The Converse and the Inverse	Are always both true or both false.
The Theorem and Its Inverse or Converse	Are *not* always both true or false.

The Geometric Meaning of Loci

The logical structure of geometry demands the use of the converse, contrapositive, and inverse of a theorem. This is clearly brought out in the study of loci in geometry.

A *locus* of points (plural, *loci*) is a geometric figure formed by all those points, and only those points, which satisfy a certain condition or set of conditions. An illustration may serve to make this idea clear.

Where are all the points which are equally distant from the two lines XY and AB? Obviously all those points, *and only those* points, which are equally distant from these two lines and in the plane of these two lines, are found on the dotted line LM. Two statements can be made *about the points* on the line LM.

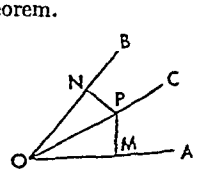


(1) If a point is on the line, then it is equally distant from XY and AB; (2) If it is equally distant from both XY and AB then it is on the line LM.

Now notice that these two statements are converses of one another. Since they are converses and both true, it is possible to say; "All those points, and *only those points*, equally distant from XY and AB (in the plane) are on the line LM." The three words "only those points" in the preceding sentence are important. They assure us that no points *not* on the line LM are equally distant from XY and AB.

The proofs of theorems involving loci always consist of two parts. This is necessary because of the definition of a locus. Note that the definition consists of two parts. These are: (1) *"all those points,* and (2) *only those points."* The following example will show how and why these two parts (a statement and its converse or a statement and its inverse) are necessary to prove a locus theorem.

Theorem: The locus of points equidistant from the sides of the angle is the bisector of the angle.



Part I of the proof: We prove that if the point is on the angle

bisector, the point is also equally distant from the sides of the angle

Given the ∠AOB and the angle bisector (OC), together with (P), a point freely chosen on the bisector

Argument

1	OP = OP	*Reason* they are identical
2	∠NOP = ∠POM	*Reason* OC is a bisector
3	∠NPO = ∠MPO	*Reason* statement 2 and the fact that the complements of equal angles are equal
4	△NPO = △MPO	*Reason* two triangles (△) are congruent if two angles and the included side of one triangle are equal to the corresponding parts in the other
5	PN = PM	*Reason* corresponding parts of congruent triangles

We now know that any point on the bisector is also equally distant from the sides We do not yet know, however, that points which are *not* equally distant from the sides of the angle are *not* on the bisector

Part II of the proof We now prove that if the point is equally distant from the sides of the angle, it must lie on the bisector of the angle

Given PN = PM and OC, the bisector of ∠BOA

To be proved P is on OC

Argument

1	PN is ⊥ to BO and PM is ⊥ to AO	*Reason* a perpendicular (⊥) may be dropped from a point to a line
2	Define PO	*Reason* two points determine a line
3	OPN and OPM are right triangles	*Reason* angles at M and N are right angles
4	PN = PM	*Reason* given
5	PO = PO	*Reason* identity
6	△PNO = △PMO	*Reason* two right triangles with the hypotenuse and one leg equal are congruent
7	∠NOP = ∠MOP	*Reason* corresponding parts
8	PO bisects angle MON	*Reason* definition
9	P lies on the bisector OC	*Reason* an angle can have but one bisector

This completes the second part of the proof

How Geometry Started in Early Times

Geometry began in the river valleys of Egypt and Mesopotamia to provide means for replacing land marks after floods for designing irrigation systems, and for controlling the building of huge temples Each people also, was interested in tracing the movements of the sun, moon planets, and stars for time-keeping maintaining a calendar, and for religious reasons A collection of practical rules and methods for solving geometric problems arose to meet these needs

To fix a location for a temple, for example the Egyptians used a triangle of rope, cut to the correct lengths to make a right angle, and they stretched the triangle tight to establish the angle on the ground The Sumerians counted the divisions of a circle by sixties, a rule we still follow with degrees, minutes, and seconds and the divisions of time

Neither people, however, tried to discover the general principles which formed the basis of the practical rules This was done by the ancient Greeks

The Greeks Discover Geometric Principles

The first man known to us who developed geometric principles was Thales of Miletus, one of the "seven wise men" honored in Greek tradition In the late 7th century or early 6th century B C , he established many *rules* about circles and developed them into *principles* concerning the properties of a circle as a geometric object regardless of how the circle might figure in practical problems

Another early contributor was the mystic and philosopher Pythagoras, of the 6th century B C He is noted for the Pythagorean theorem, that the squares of the sides of a right angle are equal to the square of the hypotenuse

Among the many individual contributions made in the next three centuries, one outstanding achievement was the development of conic sections by Apollonius of Perga The astronomer Hipparchus devised a system of *chords* which he used for computing angles in the heavens This was a forerunner of trigonometry The philosophers Plato and Aristotle gathered the principles that were known by their time and added many ideas to them

About 300 B C , Euclid of Alexandria drew together all the Greek knowledge of geometry in his 'Elements' In this work he gathered all the propositions with proof at every point from beginning to end, and organized them into a magnificently logical science The Elements' still provide the basis for the modern study of geometry

After Euclid, the greatest ancient geometer was Archimedes He devised many methods for solving problems and came close to figuring the ratio (π) of a circle's diameter to its circumference His method foreshadowed procedures of modern calculus

Descartes Applies Algebra to Geometry

Geometry remained largely as Euclid left it until early modern times In 1637, René Descartes produced the method, called *analytic geometry*, of expressing geometric relations in algebraic terms Modern graphs are examples of this method Descartes also devised a method of expressing shapes, locations and movements in space by measurements along three lines (usually called x, y, and z) that correspond to the length, breadth, and height of a solid object The lines are called *Cartesian co-ordinates* Since algebraic computation is usually easier and more productive of information than the ancient method of using figures, modern mathematicians generally study geometric problems by Cartesian methods

Modern Non Euclidean Geometries

All geometric problems that arise in everyday experience can be solved by Euclidean geometry The one doubtful point about Euclid s system is whether the world and the space surrounding it actually ' fit" this geometry The assumption that Euclidean

geometry does "fit" the space relations of the world is commonly called the Euclidean view.

During the 19th century, several mathematicians devised non-Euclidean systems based upon other assumptions. They did so as a matter of intellectual interest. Some of this work proved of value when astronomers became interested in the vast distances outside our galaxy of stars and when physicists began dealing with the tremendous velocities studied in atomic physics. Einstein used Riemann's "closed space" geometry in developing relativity, and other non-Euclidean systems may prove of practical value.

GEORGE, SAINT. No one knows for certain whether Saint George, the patron saint of England, ever existed. Certainly there was a George of Cappadocia who suffered martyrdom about A.D. 303 at Lydda, in Palestine, during a persecution of the Christians; but nothing is known of his life. Not until the 6th century A.D. was his name connected with a dragon.

During the Middle Ages many legends grew up about Saint George. The best-known story pictures him as a knight who rescued a king's daughter, Sabra (representing the Church), from a dragon (representing the Devil). After slaying the dragon, George gave all he had to the poor and went forth to preach Christianity. He died a martyr.

Saint George was adopted as the patron saint of England in the days of Edward III and the Hundred Years' War. His feast is celebrated on April 23. England's first flag was the red flag of Saint George on a white field. (*See also* Dragon; Flags.)

SAINT GEORGE AND THE DRAGON



Many artists have depicted the legendary encounter between the dragon and Saint George, patron saint of England. This engraving is by the German artist Lucas Cranach (1472–1553).

GEORGE, *Kings of* GREAT BRITAIN

SIX kings of Great Britain have borne the name George. The first four were also German princes of the House of Hanover (*see* Hanover). George V and George VI belonged to the House of Saxe-Coburg-Gotha. This house was renamed Windsor during the first World War, in the reign of George V.

GEORGE I (born 1660, ruled 1714–1727). George Louis succeeded his father as elector of Hanover, a north German state, in 1698. His mother, Sophia, was a granddaughter of James I of the English Stuart line. The English Act of Settlement (1701) had barred Catholics from the throne and exiled the Catholic heirs of the Stuarts. When Queen Anne died, in 1714, George succeeded to the British throne as the nearest Protestant heir. In 1715 a rebellion in Scotland in favor of the Stuart "pretender" was easily put down. (*See* Pretender.)

George was 55 years old when he became king of Great Britain. He was more interested in Hanover—which he continued to rule—than in Britain and divided his time between the two countries. Since he spoke only German, he left almost all the business of the British government to his ministers. Finally he even stopped attending Cabinet meetings. Sir Robert Walpole, his chief minister, headed the Cabinet in the king's place and thus became in effect Britain's first "prime" minister.

Long before George came to England, he had divorced his wife, Sophia Dorothea, for misconduct. She was imprisoned in Hanover until her death in 1726. There were two children of the marriage. The daughter married the elector of Prussia. The son succeeded his father in Hanover and in Great Britain.

GEORGE II (born 1683, ruled 1727–1760). Like his father, George I, George II was more interested in Hanover than in Britain. He was a vain, pompous little man, fond of show, but extremely economical. One of his favorite diversions, it was said, was counting his money like the king in the nursery rhyme.

George II followed his father's example in staying away from Cabinet meetings. He left government affairs to Sir Robert Walpole and later to other political leaders after Walpole retired. Under the elder William Pitt, just as the reign was ending, Britain gained brilliant victories in the French and Indian War (*see* Chatham, William Pitt, Earl of). The Jacobite rising of 1745 was a much more serious affair than that of 1715, but it too proved unsuccessful (*see* Pretender). George's queen, Caroline of Anspach, was a woman of remarkable ability who proved a tower of strength to her weak husband and to his ministers.

GEORGE III (born 1738, ruled 1760–1820). George III was a grandson of George II. (His father, Frederick, Prince of Wales, died in 1751.) He was the first of



George I



George II



George III

With George I, the German House of Hanover came to the British throne in 1714. These first three kings of the Hanoverian line were more German *than English*

the Hanovarian rulers to be born and educated in Britain. His mother, ignorant and too devoted, continually urged him: George, be king! Following this advice, *he attempted to restore the kingship of Great* Britain to a position of power not unlike that which was held by his cousin Frederick the Great of Prussia. Unlike his cousin, George had only average ability, but he had more than average obstinacy. He refused to give up his course until he had lost for Great Britain the 13 American colonies and inflicted more profound and enduring injuries upon his country than any other modern English king. William Lecky, the British historian just quoted, says also that George III spent his 60-year reign—longer than that of any other British ruler except Queen Victoria—in obstinately resisting measures which are now almost universally admitted to have been good, and in supporting measures which are as universally admitted to have been bad. By gifts of offices, titles, contracts, and even money bribes, he sought to build up in Parliament a party known as *the king's friends*. When the American colonists triumphed at Yorktown in 1781, the liberal minded Whigs took control of the government. George had long been subject to periodic attacks of insanity. During the last ten years of his life he was both insane and blind.

GEORGE IV (born 1762, ruled 1820–30). For ten years George IV reigned as king. For nine years before his accession he was prince regent (acting king) because of the insanity of his father, George III. He was a dissolute and incompetent ruler, though he *posed as the first gentleman of Europe*. His treatment of his young queen, Caroline of Brunswick, was abominable, and when he attempted to divorce her the British people were indignant. The government, both in Great Britain and in Hanover, was in the hands of his ministers. Since his only child, a daughter, had died, his brother, William IV, succeeded him (*see* William IV).

GEORGE V (born 1865, ruled 1910–1936). Britain's king during the first World War was George V. He cut himself off from all German connections and titles, and announced that the royal line would thenceforth be known not as the House of Saxe-Coburg-Gotha but as the House of Windsor, from the royal castle of that name in England.

George V was the grandson of Queen Victoria and the son of Edward VII. From the age of 12 he was *trained for the sea*. He had risen to commander of the British navy when the death of his older brother made him, at the age of 26, heir to the throne. Like *his father, he gained personal knowledge of the outlying* posts of the British dominions and colonies by a tour before he became king.

In 1893 George married Mary, the only daughter of the duke of Teck. Five of their children reached

BRITAIN'S ROYAL COACH BUILT FOR GEORGE III



This gilded coach, drawn by eight horses, is still used for state occasions such as coronations and the *opening of Parliament*. The richly ornamented carriage is supported by large tritons, two in front and two in back. The coach was built in 1761. This picture was taken in 1936 on the occasion of the coronation of George VI and Queen Elizabeth.

GEORGE V AND GEORGE VI AND THEIR QUEENS





George V, Britain's king during the first World War, died in 1936. His consort, Queen Mary, survived him and lived to see two of her sons and her granddaughter occupy the throne.



George VI came to the throne in 1936 when his elder brother, Edward VIII, abdicated. This picture was taken in 1948 on the 25th wedding anniversary of George VI and Queen Elizabeth.

maturity: Edward, prince of Wales, who became king as Edward VIII; Albert, duke of York, who succeeded Edward as George VI; the duke of Gloucester; the duke of Kent; and Mary, the princess royal, countess of Harewood.

As king, George maintained the wise policies of constitutional rule followed by his father and grandmother. During his reign the Crown became, as it had never been before, the connecting link between the mother country and the self-governing members of the British Commonwealth. In May 1935, the silver jubilee (25th year) of his reign was celebrated. He died in 1936.

Equally with George, Queen Mary shared in the love and loyalty of the British people. After the death of the king, she continued to appear at public ceremonies. She died at the age of 85 in 1953.

GEORGE VI (born 1895, ruled 1936–1952). Albert, duke of York, was the second son of King George V and Queen Mary. Upon the abdication of his elder brother, Edward VIII, in December 1936, he became king of Great Britain and took the name of George VI.

Prince Albert was sensitive and shy and had a decided stammer. He excelled, however, at athletics and was an enthusiast for sports—hunting, polo, and tennis. His education was carefully planned from childhood, and it was decided that, like his father, he should enter the navy. He went to school at Osborne and Dartmouth and took the usual examinations with the other boys. After his 17th birthday he went to sea. He was a sublieutenant on H.M.S. *Collingwood* when the ship was heavily engaged in the battle of Jutland (1916). In 1918 he was transferred to the Naval Air Service and took his pilot's certificate in 1919. He then went to Cambridge University.

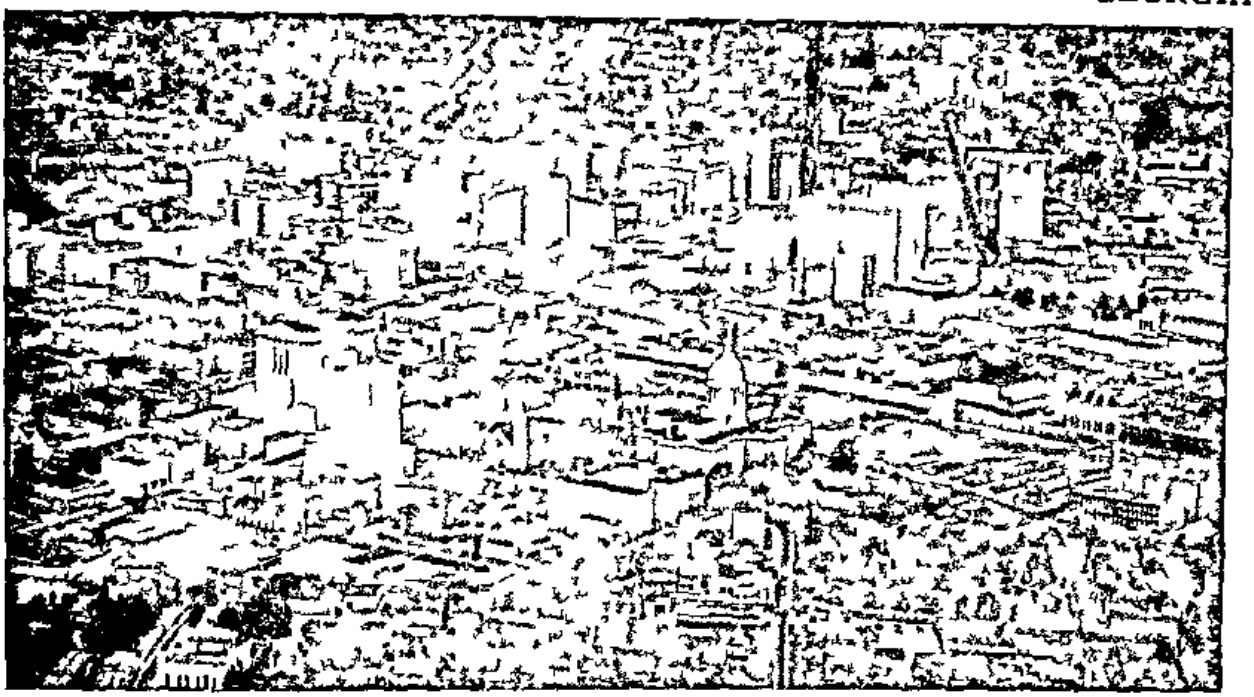
Albert was created duke of York in 1920. In 1922 he married Lady Elizabeth Bowes-Lyon (born 1900), youngest daughter of the earl and countess of Strathmore. She was of Scottish royal blood, an ancestor having married the daughter of the Scottish king Robert II in 1376. The Strathmore estate, Glamis Castle, was the scene of Shakespeare's tragedy 'Macbeth'. The "smiling duchess" soon won the affection of the people, and this affection extended to her children, Princess Elizabeth Alexandra Mary and Princess Margaret Rose.

In 1939, just before the outbreak of the second World War, George VI and his queen visited Canada and the United States. Throughout the war years they remained with their people. Much time was spent in Buckingham Palace, though this royal residence, like the rest of London, went through its ordeal of air bombing by the German air force. The presence of the king and queen in London and their messages broadcast during years of anxiety and strain did much to hearten and inspire the people of Britain and the Commonwealth nations.

The king's health gradually gave way, and he died at Sandringham, in Norfolk, in February 1952. He was succeeded by his elder daughter, who ascended the throne as Elizabeth II (*see* Elizabeth II).

GEORGE JUNIOR REPUBLIC. Near Freeville, N. Y., is a model "junior republic" where teen-age boys and girls are trained to become useful citizens. The community covers 550 acres. The village has a bank, general store, government building, and chapel. The young people make laws for their special needs, elect officials, hold court, and collect taxes. Besides going to school, they work the farms, repair buildings, run offices, cook, and keep house. They are paid in token money. The motto of the republic is: "Nothing without labor."

William Reuben George founded the community in 1895 for needy children. He believed that children in their teens can govern and support themselves and that lack of responsibility breeds indifference to law and order. Similar communities were founded in other states.



Atlanta is Georgia s capital and largest city The railroad hub of the South it is also a ch ef commer cial, industrial and cultural center of the Southland Left of the Capitol is the 14-story City Hall.

GEORGIA—*The* "EMPIRE STATE *of the* SOUTH"

GEORGIA STATE OF As the state of New York is called the Empire State so is Georgia nick named the Empire State of the South The name reflects its size and rapid and varied industrial growth It is the largest state east of the Mississippi River and has an area nearly as great as all New England

About half of Georgia s area is covered with for ests and it is the second state east of the Pacific coast in lumber product on Only Oregon Washing ton California and Alabama surpass it On its farm land Georgia grows a great array of different crops Various locations have the right combination of soil and climate for almost every important crop of the temperate zone It also has many fru ts vegetables and other plants typical of subtropical regions

The state s rivers yield hydroelectric power and help sustain a high level of manufacturing activity Georgia ranks among the first four states of the Union in a number of cotton textile products The state is also a veritable crossroads of the South Within the state the best ra l and highway routes between New York and New Orleans crisscross those between Florida and the central western states These fol low natural routes that have long made Georgia a much traversed state Georgia also has a fine outlet for ocean borne commerce in the historic port of Savannah Cotton fuel oil and lumber are shipped to world markets from here Cane sugar is the largest import (*see* Savannah)

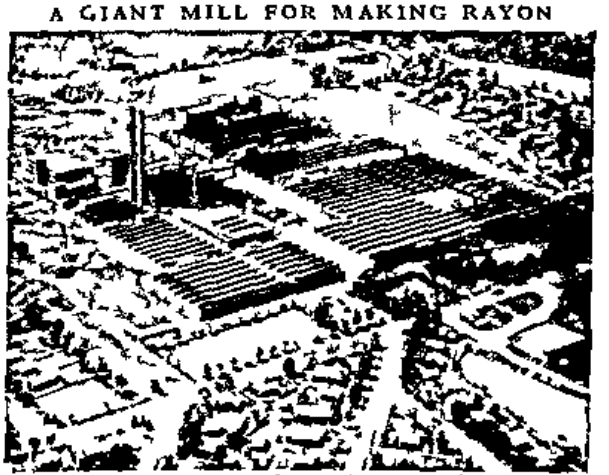
Three Diverse Natural Regions

The land of Georgia slopes gradually from moun tains in the northwest to sea level in the southeast It is divided into three great natural sections—the northern Appalachian region the central Piedmont Plateau and the low Coastal Plain

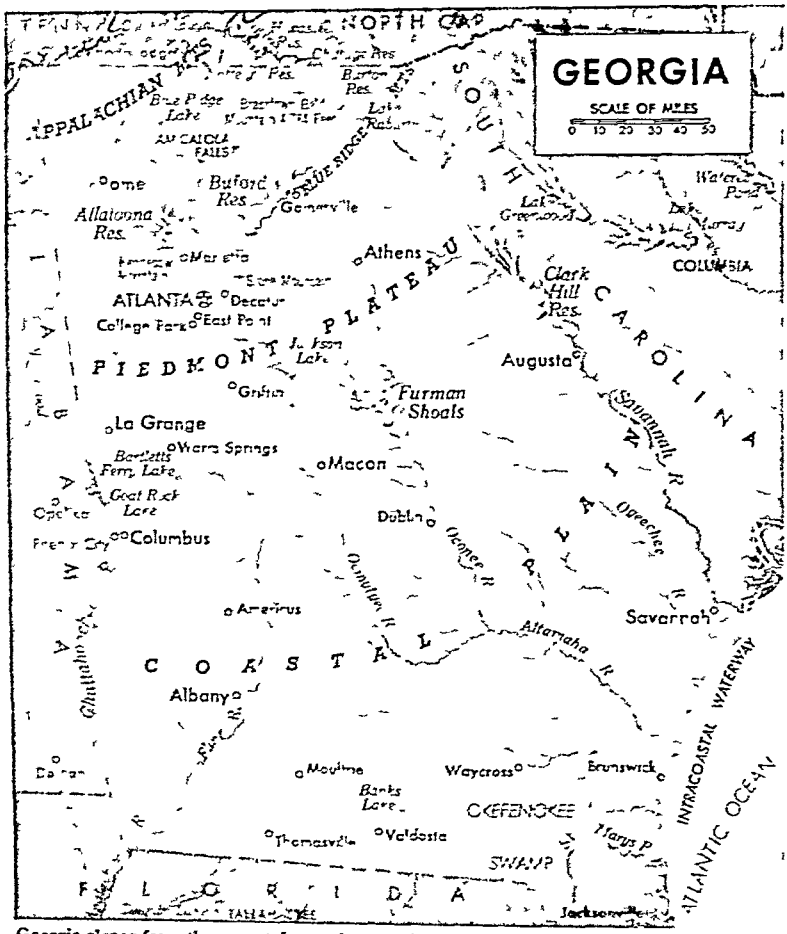
The smallest of these sections is the Appalachian region often called the state s roof garden Here are many beautiful waterfalls cascades and winding streams set aga nst forested hills and mountains Many spots have interesting caves Near Cartersville on the Etowah River is the Allatoona Dam completed in 1949 This section also has quiet valleys carpeted with pastures grain fields and orchards

The Appalachian region gradually gives way to the Piedmont Plateau This is gently rolling country spot ted with isolated hills In this section is Stone Moun-

A GIANT MILL FOR MAKING RAYON



The number one industry of Georg a is the manufacture of tex tiles This sprawling factory at Rome is the plant of the Cela nese Corporation of America for the production of rayon yarn



Georgia slopes from the mountains to the sea. The Appalachian Mountains are in the northwest. In central Georgia is the Piedmont Plateau with most of the cities and farms. In the southeast is the low Coastal Plain with pine forests. Islands fringe the coast.

tain, 800 feet high and a mile in diameter. It is the largest granite dome in North America and is the site of an unfinished memorial to the Confederacy.

The Piedmont Plateau is Georgia's most densely populated section. It has most of the important cities and most of the cultivated land. It grows large quantities of cotton, corn, and other field crops.

The Piedmont ends at the fall line, where the rivers pour down rapids or over falls to the Coastal Plain. The wide and low plain occupies more than a third of the state. Here many of the rivers are large and deep enough for navigation. Here also are extensive sandy areas known as "pine barrens," where the famous Georgia pine grows in abundance. Many of these forested lands have been cleared and enriched with native marls and swamp muck to make excellent farming land. Many islands dot the Atlantic shore.

In the extreme southeast, extending into Florida, is the beautiful wilderness called Okefenokee Swamp. The Georgia portion covers about 700 square miles. This swamp has many kinds of trees and plants and a variety of birds, fish, and other game. About 330,000 acres of the swamp are in a federal government preserve known as the Okefenokee National Wildlife Refuge. This region has long been a favorite of naturalists.

Farms of Georgia

Georgia's most valuable farm product is cotton. It grows in almost every section of the state, from the northern valleys to the numerous islands along the coast. Corn is next in importance. It also is grown practically everywhere. Peanuts are the state's third most valuable farm crop. Other important products are milk, hogs, tobacco, chickens, eggs and cottonseed.

Nearly all sections raise some fruit. Many peaches, watermelons, and cantaloupes are grown and shipped to northern markets. Because of its early growing season, Georgia is among the first states to supply these delicacies annually. The middle and southern sections produce sugar cane for syrup. Near the coast pecan trees yield a valuable crop. Raising cattle is increasingly important.

Forests and Minerals

The state's vast forests, covering about 33,000 square miles, are an important source of wealth. The Georgia pine yields many products. Its long slender trunk is good for furniture, building, pulp, and paper. Its bark is used in making charcoal, and both roots and bark are turned into lampblack. The sawdust is distilled into wood alcohol and creosote. The seed of the Georgia pine is fed to hogs. In addition, the sap of this valuable tree supplies turpentine and rosin for which Georgia is a leading state.

Although Georgia does not rank high in mineral resources, deposits of about 44 minerals have been found in the state. Clays (including fuller's earth), stone, and cement are the most important of these minerals. The state ranks first in output of kaolin, or china clay. It is noted for its fine quality white marble and its large granite quarries. Georgia also produces sand and gravel; talc, barite; iron ore; lime; and bauxite, for making aluminum.

Manufactures and Cities

In the decade ending with 1950, manufacturing passed agriculture, forestry, and fishing as the leading occupation in Georgia. Both fields of employ-

Continued on page 72

Georgia Fact Summary

GEORGIA (Ga.) Named in honor of King George II of England who in 1732 granted charter for colony to Englishmen led by James Oglethorpe
Nickname *As New York is the* Empire State so Georgia is the Empire State of the South for its size and rapid varied industrial growth
Seal An arch with word Constitution written on it supported by three pillars representing Wisdom Justice and Moderation
Motto Wisdom Justice and Moderation
Flag For description and illustration *see* Flags
Flower Cherokee rose **Bird** Brown thrasher **Tree** Live oak **Song** Georgia—words Robert Loyman music Lollie Belle Wylie

THE GOVERNMENT



Capital Atlanta (since 1868)
Representation in Congress Senate 2 House of Representatives 10 *Electoral votes* 12
General Assembly: Senators 54 term, 2 years Representatives 205 term 2 years Meets 2d Monday in Jan. in odd years session limit, 70 days
Constitution Eighth adopted in 1945 Proposed amendments must be (a) passed by two-thirds majority of both legislative houses and (b) ratified by majority voting on amendment at popular election
Governor Term 4 years May be re-elected 4 years after *serving a term*
Other Executive Officers Lieutenant governor secretary of state attorney general treasurer comptroller general commissioner of agriculture commissioner of labor all elected terms 4 years
Judiciary Supreme court—7 justices elected at large term 6 yrs Court of Appeals—6 judges elected term 6 yrs Superior courts—159 in 35 judicial circuits 35 judges elected term 4 yrs Courts of ordinary—one per county judges elected term 4 yrs
County 159 counties governed by boards of commissioners numbering from 1 to 6 If no board exists county is governed by an ordinary corresponding to probate judge in other states Most boards and county officers elected
Municipal Mayor and council most common
Voting Qualifications Age 18 (since 1943) residence in state 1 year in county 6 months literacy test

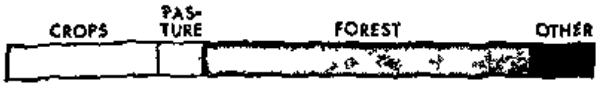


TRANSPORTATION AND COMMUNICATION

Transportation Railroads 6 000 miles First railroad Georgia Railroad (50 miles out of Augusta) 1837 reached Athens 1841 Rural roads 88 200 miles Airports 114
Communication Periodicals 96 Newspapers 246 First newspaper *Georgia Gazette* Savannah 1763 Radio stations (AM and FM) 96 first station WSB Atlanta licensed March 15 1922 Television stations 3 first station WSB-TV Atlanta began operation Sept 29 1948 Telephones 717 400 Post offices 873

THE PEOPLE AND THEIR LAND

Population (1950 census) 3 444 578 (rank among 48 states—13th) urban 45 3% rural 54 7%. Density 58 9 persons per square mile (rank—24th state)
Extent Area 58 876 square miles including 393 square miles of water surface (20th state in size)
Elevation Highest Brasstown Bald Mountain near Blairsville 4 784 feet lowest sea level
Temperature (F.) Average—annual 65° winter 49° spring 64 summer 80 fall 65 Lowest recorded 17° (near Lafayette Jan 27 1940) highest recorded 112° (Louisville July 24 1925)
Precipitation Average (inches)—annual 50 winter 13 spring 12 summer 16 fall 9 Varies from about 76 in northeast to about 46 in east central
Natural Features From the northwest corner the land gradually slopes to sea level forming three separate regions the Appalachian Mountains in extreme northwest the densely populated Piedmont Plateau lying between the Appalachians and the fall line the Coastal Plain region comprising the southern third of state Principal rivers Altamaha Chattahoochee Flint Ogeechee Oconee Ocmulgee St Marys Savannah
Land Use Cropland 25% nonforested pasture 7% forest 56% other (roads parks game refuges wasteland cities etc.) 12%



Natural Resources *Agricultural*—mild climate fertile soil suitable for many kinds of crops *Industrial*—deposits of clay stone streams for water power forests fisheries *Commercial*—port of Savannah historic and scenic places attract vacationists

OCCUPATIONS AND PRODUCTS

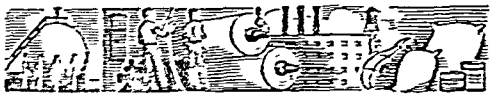
What the People Do to Earn a Living



Major Industries and Occupations 1950

Fields of Employment	Number Employed	Percentage of Total Employed
Manufacturing	88 193	23 0
Agriculture forestry and fishery	77 704	20 1
Wholesale and retail trade	61 704	16 1
Personal services (hotel domestic laundering etc.)	102 64	9 8
Professional services (medical legal educational etc.)	8 125	6 5
Transportation communication and other public utilities	75 955	6.1
Construction	71 865	5 7
Government	48 450	3 9
Finance insurance and real estate	30 197	2 4
Business and repair services	23 135	1 8
Amusement recreational and related services	9 755	0 7
Mining	*5 04*	*0 4*
Workers not accounted for	18 991	1 5
Total employed	1 254 035	*100*

Georgia Fact Summary

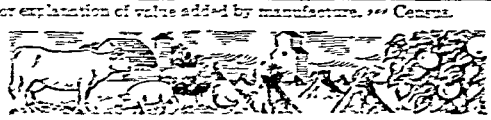


What the People Produce

A. Manufactured Goods (Rank among states—19th)
Value added by manufacture* (1952), $1,355,318,000

Leading Industries in 1947 (with Principal Products)	Value Added by Manufacture	Rank among States
TEXTILE MILL PRODUCTS..... Cotton broad-woven fabrics; yarn and thread mills; hosiery mills; rayon broad-woven fabrics	$398,023,000	6
FOOD AND KINDRED PRODUCTS ... Bakery goods; soft drinks; flavorings; meat packing; confectioneries	133,448,000	21
LUMBER AND PRODUCTS ..... Sawmills and planing mills; wooden boxes; wood preserving	88,466,000	6
CHEMICALS AND ALLIED PRODUCTS . Gum and wood chemicals; fertilizers; vegetable and animal oils	77,043,000	17
APPAREL AND RELATED PRODUCTS.. Men's and boys' furnishings	76,084,000	10
PAPER AND ALLIED PRODUCTS.....	54,207,000	17

*For explanation of value added by manufacture, see Census.



B. Farm Products (Rank among states—17th)
Total cash income (1952), $652,898,000

Products	Amount Produced (10-Year Average)	Rank within State*	Rank among States†
Cotton lint....	738,000 bales	1	5
Corn.....	46,792,000 bu.	2	18
Peanuts.....	691,000 lbs.	3	1
Hogs.....	363,231,000 lbs.	4	14
Milk.....	538,000,000 qts.	5	29
Tobacco.....	90,527,000 lbs.	6	6

*Rank in dollar value †Rank in units produced



C. Fish (Rank among states—16th)
(Marine waters and coastal rivers, 1950), catch, 17,351,000 lbs.; value, $3,584,000

D. Minerals (Fuels, Metals, and Stone)
Annual value (1951), $48,509,000
Rank among states—32d

Minerals (1951)	Amount Produced	Value
Clay.....	2,528,000 tons	$23,090,000
Stone.....	6,026,000 tons	15,765,000
Cement*.....		

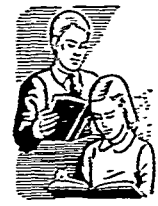
*Cement ranks 24 in value; exact figures not available.

E. Lumber (Rank among states—5th)
1,689,000,000 board feet (5-year average)

F. Trade

Trade (1948)	Sales	Rank among States
Wholesale.....	$3,331,185,000	14
Retail.....	2,111,539,000	19
Service.....	184,598,000	17

EDUCATION



Public Schools: Elementary, 1,858; secondary, 1,255. Compulsory school age, 7 through 16. State Board of Education, 10 members (one from each congressional district), appointed by governor, 7-year terms. State supt. elected, 4-year terms. County supts. elected, 4-year terms. City boards of education usually 5 members, 3-year terms. City supts. appointed by city boards, 1 to 3-year terms.

Private and Parochial Schools: 72.

Colleges and Universities (accredited): Colleges—white, 17; Negro, 9. Junior colleges, 17. The state university system includes 18 divisions, of which three are Negro colleges. The largest state universities are University of Georgia, Athens; Georgia Inst. of Technology, Atlanta; University System Center, Atlanta; Georgia State College for Women, Milledgeville.

Special State Schools: Georgia Academy for the Blind, Macon; Georgia School for the Deaf, Cave Spring; Georgia School for Mental Defectives, Gracewood; North Georgia Vocational School, Clarkesville; South Georgia Trade School, Americus.

Libraries: City and town public libraries, 37; 23 regional library systems serve 57 counties; 83 independent county library systems. Division of Instructional Materials and Library Services, State Dept. of Education, aids in developing public and school library service.

Outstanding Museums: Children's Nature Museum, High Museum of Art, Atlanta; Old Pirates' House, Telfair Academy of Arts and Sciences, Savannah.

CORRECTIONAL AND PENAL INSTITUTIONS

Ga. State Prison, Reidsville; Ga. Training School for Boys, Milledgeville; Ga. Training School for Girls (white), Atlanta; Ga. Training School for Girls (Negro), Macon; Ga. Industrial Inst., Alto.

PLACES OF INTEREST*

Allatoona Dam—on Etowah R. near Cartersville and (9).

Andersonville Prison Park—site of Camp Sumter, large Confederate prison in Civil War (24).

Athens—pre-Civil War houses; Univ. of Georgia (12).

Atlanta—the Capitol; immense painting of battle of Atlanta in Cyclorama Building; Crypt of Civilization at Oglethorpe University (*see* Atlanta) (10).

Augusta—site of Fort Augusta (1735) marked; 76-ft. Confederate Monument; Augusta National Golf Club, where President Eisenhower vacations (*see* Augusta) (14).

Chickamauga and Chattanooga National Military Park—commemorates battle of Chickamauga (1863) (2).

Clark Hill Dam—on Savannah River near Augusta; for power and flood control; 36-mile-long reservoir (14).

Columbus—Fort Benning, U. S. Army Infantry training center, nearby (23).

Fort Frederica National Monument—ruins of fort built in 1736 as defense against Spanish (33).

Fort Pulaski National Monument—well-preserved fort built 1829–47 to guard mouth of Savannah River (27).

Ida Cason Gardens—near Warm Springs (29).

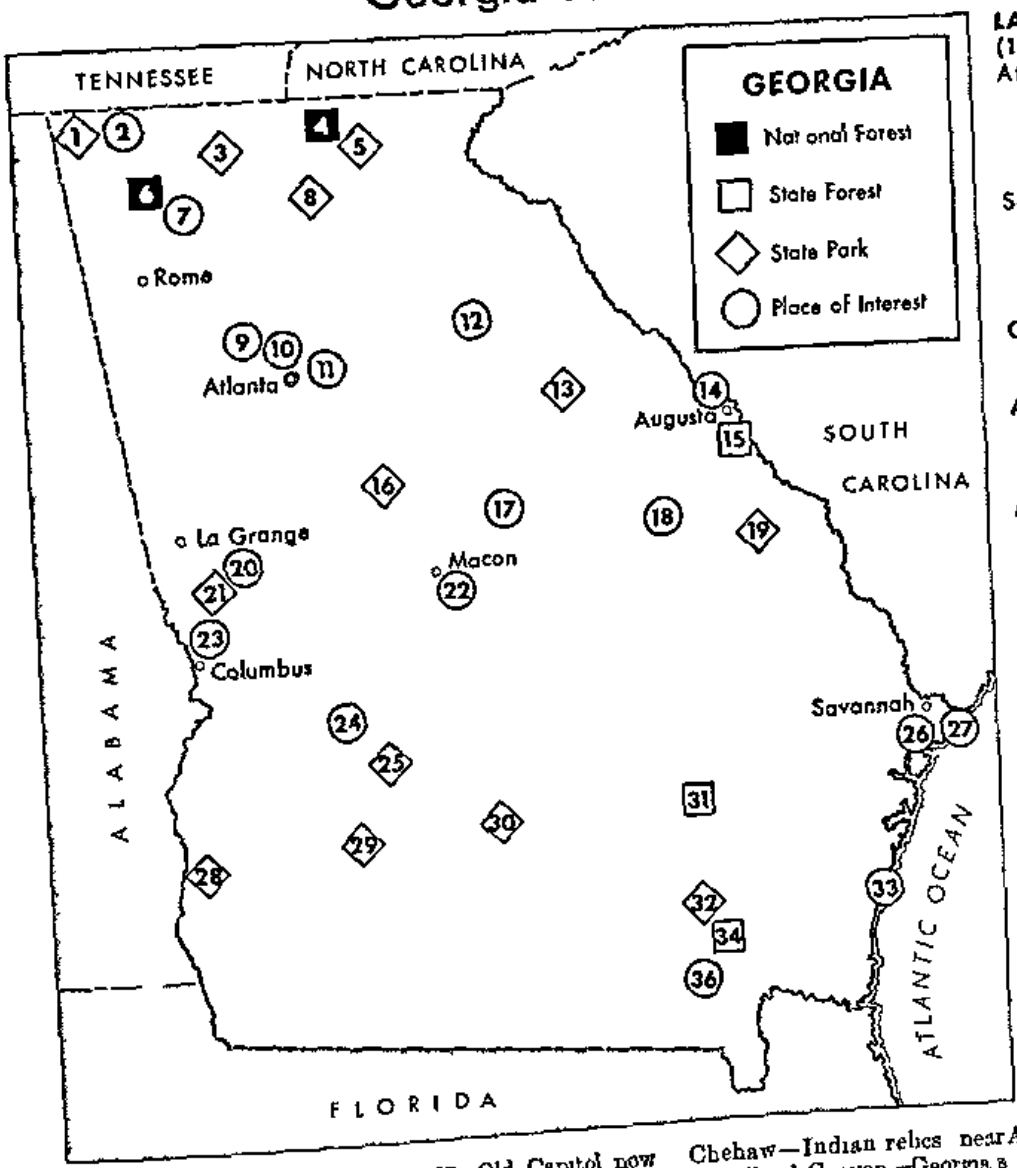
Kennesaw Mt. Nat'l Battlefield Park—near Marietta; site of Sherman's assault on Confederate forces (9).

Louisville—state capital (1795–1807); Slave Market built before 1800 remains intact (18).

Macon—replica of Fort Hawkins (1806) on original site; home of Sydney Lanier, poet; Ocmulgee National Monument—Indian mounds, Indian Council House (22).

*Numbers in parentheses are keyed to map.

Georgia Fact Summary



LARGEST CITIES
(1950 census)

Atlanta (331 314) state capital railway center textiles paper products educational institutions

Savannah (119 638) Atlantic port and industrial center naval stores pulp paper mills

Columbus (79 611) produces textiles, lumber chemicals

Augusta (71 508) Savannah River port U S arsenal cotton market textiles

Macon (70 759) textiles clay products railroad shops

Albany (31 155) peanut and pecan market

Rome (29 615) cotton rayon lumber mills

NATIONAL FOREST*

Chattahoochee—1 518 362 acres hdqrs, Gainesville (4 6)

STATE PARKS*†

Alexander H Stephens Memorial—near Crawfordville restored Liberty Hall Stephens home (13)

Allatoona—lake formed by dam near Acworth s w of (8)

Amicalola Falls—near Emma 729-ft waterfall (8)

Milledgeville—state capital 1807–67 Old Capitol now occupied by Georgia Military College (17)

New Echota Marker—northeast of Calhoun site of last Cherokee capital in state (7)

Okefenokee Swamp Park—jungle like swamp (36)

St Simon Island—one of the Sea Islands famous as vacation land resort of Sea Island on east shore (33)

Savannah—art collections in Telfair Academy of Arts and Sciences gardenlike beauty in nearby Bonaventure Cemetery Bethesda Orphanage founded in 1740 restored Trustee's Garden Village (*see* Savannah) (26)

Stone Mountain—large granite dome site of planned Confederate Memorial partly carved (11)

Warm Springs—foundation for treatment of infantile paralysis F D Roosevelt's Little White House (20)

Chehaw—Indian relics near Albany (29)

Cloudland Canyon—Georgia's Little Grand Canyon, natural lookout at Sitton's Gulch affords magnificent view from 2 000-ft altitude near Trenton (1)

Crooked River—near Kingsland water sports e of (36)

Fort Mountain—near Chatsworth stone fort (1539) believed to be Indian defense against De Soto (3)

Franklin D Roosevelt—near Chipley beautiful view of Pine Mountain Valley bell-shaped swimming pool (21)

Georgia Veterans Memorial—lake near Cordele (25)

Hard Labor Creek—Rutledge outdoor sports w of (13)

Indian Springs—mineral springs attract many health seekers picnic groves and hiking trails (16)

Jefferson Davis Memorial—Irwinville marker where Davis was captured in 1865 Confederate Museum (30)

Kolomoki Mounds—important to archeologists because of the Indian relics they contain near Blakely (28)

Laura S Walker—near Waycross group camping (30)

Little Ocmulgee—near McRae outdoor sports n e of (30)

Magnolia Spring—nine million gallons of water flow from spring daily swimming pool near Millen (19)

Vogel—primitive wilderness in Blue Ridge Mountains Lake Trahlyta Nottley Falls many foot trails (5)

STATE FORESTS*

Baxley (Appling Co)—1 000 acres (31)

Gewn Nixon (Richmond Co)—100 acres (15)

Lowndes (Lowndes Co)—15 acres near Valdosta

Milledgeville (Baldwin Co)—690 acres n e of Macon

Ocmulgee (Telfair Co)—120 acres northwest of (31)

Waycross (Ware Co)—37 731 acres (34)

*Numbers in parentheses are keyed to map.

†There are 21 state parks in Georgia 17 are given here

Georgia Fact Summary

THE PEOPLE BUILD THEIR STATE



1540—De Soto marches from Florida through part of Georgia.
1560—Tristan de Luna searches for gold in north Georgia.
1566—Pedro Menéndez de Avilés builds fort on St. Catherines I.; claims area for Spain; Indians drive out Spanish after 2 years.
1663—Charles II of England grants present territory of Georgia to "lords proprietors" of Carolina.
1721—English build first fort (King George).
1732—George II of England grants charter giving imprisoned English debtors right to settle in Georgia.
1733—Gen. James Oglethorpe arrives with 120 colonists, February 12, founding Savannah. Creek Indians sign land treaty with Oglethorpe.
1735—Importation of slaves into colony prohibited.
1736—John and Charles Wesley arrive at Savannah to preach Methodism; return to England, 1738. Oglethorpe establishes fortified town of Frederica.
1740—Georgia supports Britain in war with Spain.
1742—General Oglethorpe's troops defeat Spaniards at battle of Bloody Marsh on St. Simon Island.
1749—Importation of slaves becomes legal.
1754—Georgia becomes royal province.
1763—Treaty of Paris gives Georgia land west to Mississippi R., north to Carolina, south to St. Marys, Flint, and Chattahoochee rivers and 31st parallel.
1775—First provincial congress meets in Savannah; Council of Safety sends delegates to Continental Congress.
1777—First state constitution ratified.
1778—British troops capture Savannah, December 29.
1782—British troops leave Savannah; city again becomes seat of state government.
1785—U. of Georgia is first state university chartered in America, January 27; opens in Athens, 1801.
1786—Augusta becomes temporary state capital.
1787—Eastern boundary with South Carolina fixed along Savannah, Tugaloo, and Chattooga rivers.
1788—Georgia is fourth state to ratify U. S. Constitution.
1795—Capital moved to Louisville. Legislature grants western lands to four land companies in statute later called "Yazoo Fraud"; act repealed in 1796.
1802—State cedes western lands to U. S. for $1,250,000; accepts Chattahoochee River as western boundary.
1804—Milledgeville becomes state capital.
1815—Bank of State of Georgia chartered.
1819—*Savannah*, first steamship to cross Atlantic (with aid of sails), sails from Savannah, May 22.
1828—Indian conflicts follow gold discovery in Cherokee territory; Indians removed from state 1835-38.
1861—Georgia secedes from Union, January 19. Alexander H. Stephens, born in Taliaferro Co., elected vice-president of Confederate States of America.
1863—Federals defeated at Chickamauga, September 20.
1864—Sherman burns Atlanta, November 4, begins march to sea; he occupies Savannah, December 21.
1865—Jefferson Davis, president of Confederate States, captured by Federal forces near Irwinville.
1868—Georgia ratifies 14th Amendment; Federal troops leave state; Atlanta named state capital, March 11.
1870—Georgia readmitted to Union, July 15.
1876—Joel Chandler Harris, born in Eatonton, joins *Atlanta Constitution*; begins 'Uncle Remus' stories.
1888—Thomas E. Watson, born in Columbia Co., elected to Congress; is Populist vice-presidential candidate, 1896, and presidential candidate, 1904.
1901—Federal penitentiary opened in Atlanta.
1922—Fort Benning (infantry-training center) opened.
1937—Margaret Mitchell, born in Atlanta, wins Pulitzer prize for Civil War novel 'Gone with the Wind.'
1943—Voting age lowered to 18.
1945—New state constitution adopted; poll tax abolished.
1949—Allatoona Dam on Etowah River completed for power and flood control.
1951—State passes 3% sales and use tax; bans wearing in public of masks such as Ku Klux Klan uses.
1952—Annexation by Atlanta trebles its area. Savannah dedicates new port facilities. Clark Hill Dam on Savannah R. completed; generates power, 1953.

INDEX TO THE MAP OF GEORGIA

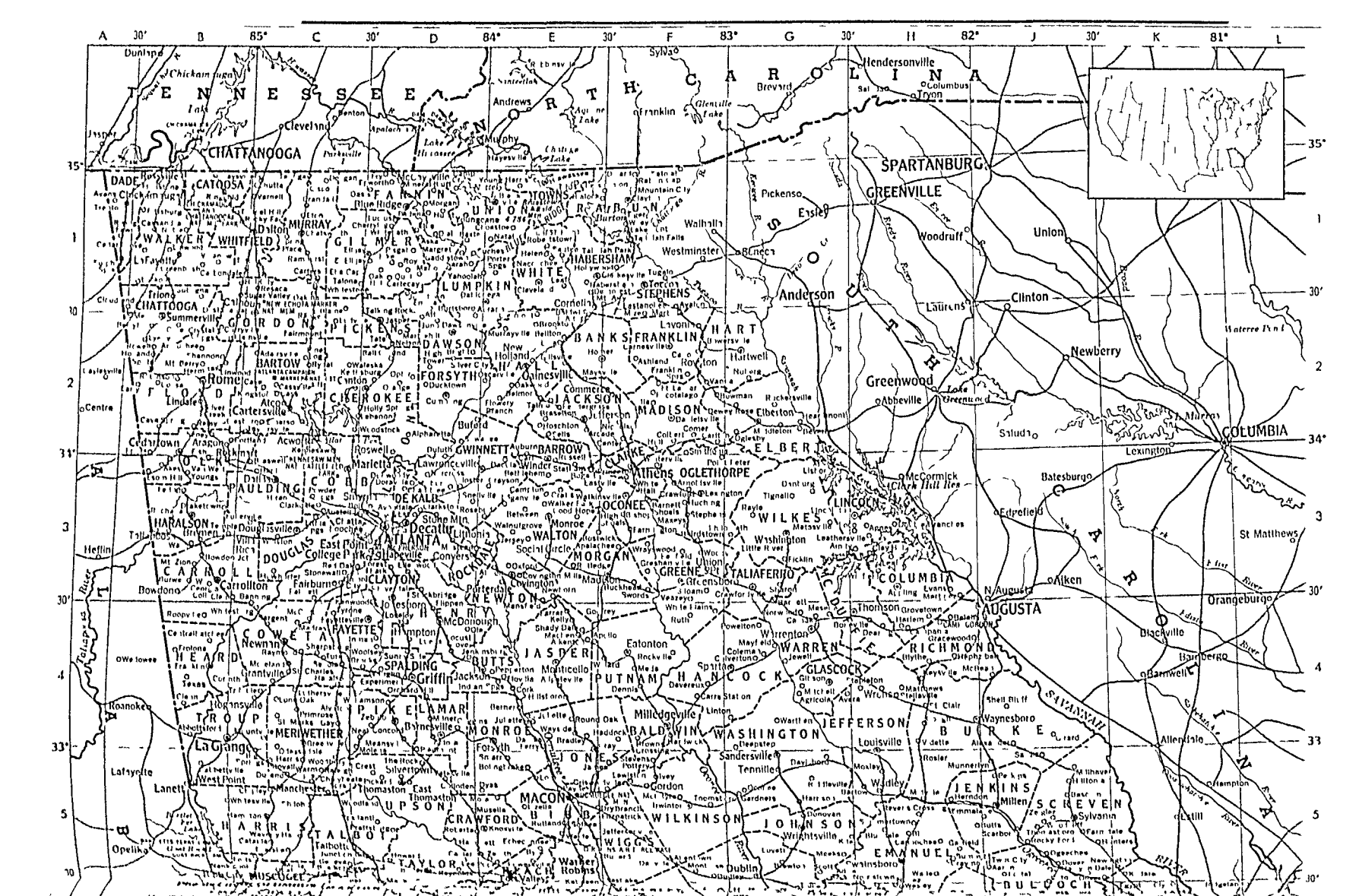
COUNTIES		
Appling	14,003	H 7
Atkinson	7,362	G 8
Bacon	8,940	G 7
Baker	5,952	D 8
Baldwin	29,706	F 4
Banks	6,935	E 2
Barrow	13,115	E 2
Bartow	27,370	C 2
Ben Hill	14,879	F 7
Berrien	13,966	F 8
Bibb	114,079	E 5
Bleckley	9,218	F 6
Brantley	6,387	J 8
Brooks	18,169	E 9
Bryan	5,965	K 6
Bulloch	24,740	J 6
Burke	23,458	J 4
Butts	9,079	E 4
Calhoun	8,578	C 7
Camden	7,322	J 9
Candler	8,063	H 6
Carroll	34,112	B 3
Catoosa	15,146	B 1
Charlton	4,821	H 9
Chatham	151,481	K 6
Chattahoochee	12,149	C 6
Chattooga	21,197	B 1
Cherokee	20,750	D 2
Clarke	36,550	F 3
Clay	5,844	B 7
Clayton	22,872	D 3
Clinch	6,007	G 9
Cobb	61,830	C 3
Coffee	23,961	G 8
Colquitt	33,999	E 8
Columbia	9,525	H 3
Cook	12,201	F 8
Coweta	27,786	C 4
Crawford	6,080	E 5
Crisp	17,663	E 7
Dade	7,364	A 1
Dawson	3,712	D 2
Decatur	23,620	C 9
De Kalb	136,395	D 3
Dodge	17,865	F 6
Dooly	14,159	E 6
Dougherty	43,617	D 7
Douglas	12,173	C 3
Early	17,413	C 8
Echols	2,494	G 9
Effingham	9,133	K 6
Elbert	18,555	G 2
Emanuel	19,789	H 5
Evans	6,653	J 6
Fannin	15,192	D 1
Fayette	7,978	C 4
Floyd	62,899	B 2
Forsyth	11,005	D 2
Franklin	14,446	F 2
Fulton	473,572	D 3
Gilmer	9,963	D 1
Glascock	3,579	G 4
Glynn	29,046	J 8
Gordon	18,922	C 2
Grady	18,928	D 9
Greene	12,843	F 3
Gwinnett	32,320	D 2
Habersham	16,553	E 1
Hall	40,113	E 2
Hancock	11,052	G 4
Haralson	14,663	B 3
Harris	11,265	C 5
Hart	14,495	G 2
Heard	6,975	B 4
Henry	15,857	D 4
Houston	20,964	E 6
Irwin	11,973	F 7
Jackson	18,997	E 2
Jasper	7,473	E 4
Jeff Davis	9,299	G 7
Jefferson	18,855	H 4
Jenkins	10,264	J 5
Johnson	9,893	G 5
Jones	7,538	E 5
Lamar	10,242	D 4
Lanier	5,151	F 8
Laurens	33,123	G 6
Lee	6,674	D 7
Liberty	8,444	J 7
Lincoln	6,462	H 3
Long	3,595	J 7
Lowndes	35,211	F 9
Lumpkin	6,574	D 1
McDuffie	11,443	H 4
McIntosh	6,005	K 7
Macon	14,213	D 6
Madison	12,238	F 2
Marion	6,521	C 6
Meriwether	21,055	C 4
Miller	9,023	C 8
Mitchell	22,528	D 8
Monroe	10,523	E 4
Montgomery	7,901	G 6
Morgan	11,899	F 3
Murray	10,676	C 1
Muscogee	118,028	C 6
Newton	20,185	E 3
Oconee	7,009	F 3
Oglethorpe	9,958	F 3
Paulding	11,752	C 3
Peach	11,705	E 5
Pickens	8,855	D 2
Pierce	11,112	H 8
Pike	8,459	D 4
Polk	30,976	B 3
Pulaski	8,808	E 6
Putnam	7,731	F 4
Quitman	3,015	B 7
Rabun	7,424	F 1
Randolph	13,804	C 7
Richmond	108,876	H 4
Rockdale	8,464	D 3
Schley	4,036	D 6
Screven	18,000	J 5
Seminole	7,904	C 9
Spaulding	31,045	D 4
Stephens	16,647	F 1
Stewart	9,194	C 6
Sumter	24,205	D 6
Talbot	7,687	C 5
Taliaferro	4,515	G 3
Tattnall	15,939	J 6
Taylor	9,113	D 5
Telfair	13,221	G 7
Terrell	14,314	D 7
Thomas	33,932	E 9
Tift	22,645	E 8
Toombs	17,382	H 6
Towns	4,803	E 1
Treutlen	6,522	G 6
Troup	49,841	B 4
Turner	10,479	E 7
Twiggs	8,308	F 5
Union	7,318	E 1
Upson	25,078	D 5
Walker	38,198	B 1
Walton	20,230	E 3
Ware	30,289	H 8
Warren	8,779	G 4
Washington	21,012	G 4
Wayne	14,248	J 7
Webster	4,081	C 6
Wheeler	6,712	G 6
White	5,951	E 1
Whitfield	34,432	B 1
Wilcox	10,167	F 7
Wilkes	12,388	G 3
Wilkinson	9,781	F 5
Worth	19,357	E 8

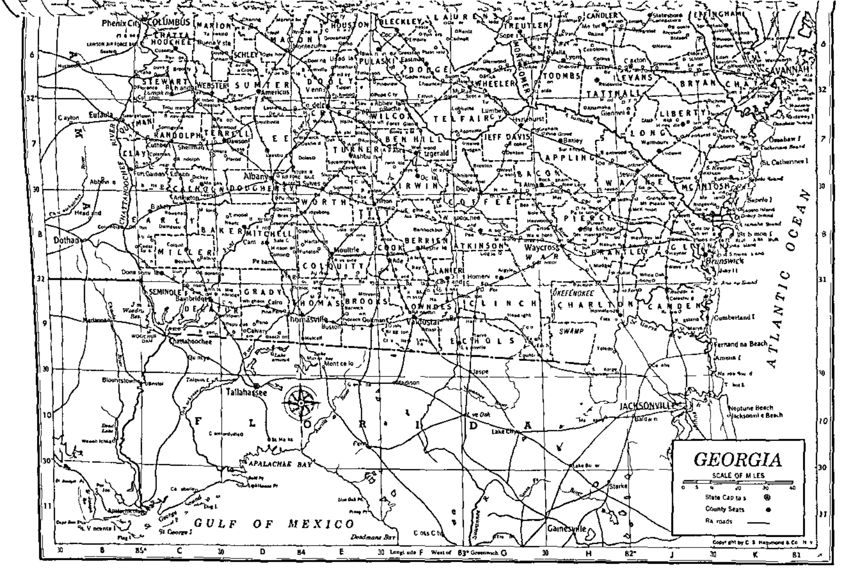
GEORGIA

CITIES AND TOWNS

Aaron	50	J 5
Abac		E 8
Abba		F 7
Abbeville	890	F 7
Abbottsford	40	B 4
Acree	225	D 7
Acworth	1 466	C 2
Adairsville	916	C 2
Adel	2 776	F 8
Adgateville	75	E 4
Adrian	503	G 5
Afton	7	D 2
Agnes	30	H 3
Agricola	45	G 4
Aikenton		E 4
Ailey	509	G 6
Akes	400	B 3
Alamo	800	G 6
Alapaha	505	F 8
Albany	31 155	D 7
Aldora	591	D 4
Alexander	90	J 4
Aline	100	H 6
Allenhurst	150	J 7
Allentown	450	F 5
Allenville	15	F 8
Alma	2 588	G 7
Almon	135	E 3
Alpharetta	917	D 2
Alston	147	H 6
Altamaha		H 7
Alto	302	E 2
Alvaton	95	C 4
Amboy	50	E 7
Ambrose	470	G 7
Americus	11 389	D 6
Amity		H 3
Amsterdam	700	D 9
Andersonville	281	D 6
Apalachee	178	E 3
Apollo	25	F 4
Appling	250	H 3
Arabi	376	F 7
Aragon	1 272	B 2
Arcade	114	E 2
Arcola	78	J 6
Argyle	244	G 8
Arlington	1 382	C 8
Armuchee		B 2
Arnoldsville	150	F 3
Arp	50	F 7
Ashburn	2 918	E 7
Ashland	250	F 2
Aska	35	D 1
Atco	1 443	C 2
Athens	28,180	F 3
Atkinson	500	J 8
ATLANTA	331 314	D 3
Attapulgus	457	D 9
Auburn	301	E 2
Augusta	71 508	J 4
Auraria	200	E 1
Austell	1 413	C 3
Autreyville	100	E 8
Avalon	151	F 1
Avans	1 000	A 1
Avera	230	H 4
Avondale Estates	1 070	D 3
Axson	200	G 8
Babcock		C 8
Baconton	500	D 8
Bainbridge	7 562	C 9
Bairdstown	75	F 3
Baldwin	490	E 2
Ball Ground	700	D 2
Banning	225	C 3
Bannockburn	15	F 8
Barnesville	4 185	D 4
Barnett	60	G 3
Barnett Shoals		F 3
Barney	157	E 8
Barretts	150	F 8
Bartow	347	G 5
Barwick	436	E 9
Bascom	30	J 5
Baxley	3 409	H 7
Baxter		D 1
Beach	62	G 8
Beachton	50	D 9
Belar		H 4
Bellton	266	E 2
Bellville	300	H 6
Belmont	100	E 2
Bemiss	50	F 9
Benevolence	157	C 7
Berlin	309	E 6
Berner	175	E 4
Berryton	520	B 2
Bethlehem	240	E 3
Between	120	E 3
Beverly		G 2
Bibb City	1 452	B 5
Big Springs	25	C 5
Bingen	4	C 9
Bishop	253	F 3
Blackshear	2 271	H 8
Bladen	8	J 8
Blaine	95	C 1
Blairsville	430	F 1
Blakely	3 234	C 8
Blalock	50	E 1
Blitchton	50	J 6
Bloomingdale	350	K 6
Blue Ridge	1 718	D 1
Bluffton	244	C 7
Blun	150	H 5
Blundale	118	H 5
Blythe	268	H 4
Bogart	459	E 3
Bolen	90	G 8
Bolingbroke	87	E 5
Bolton	2 000	D 3
Boneville	100	G 4
Boston	1 035	F 9
Bostwick	287	F 3
Bowdon	1 155	B 3
Bowdon Jct	450	B 3
Bowens Mill		F 7
Bowersville	303	G 2
Bowman	714	G 2
Box Springs	100	C 5
Boykin	120	C 8
Bradley	100	E 4
Braselton	165	E 2
Braswell	25	C 3
Bremen	2 299	B 3
Brentwood	50	H 7
Brest		D 8
Brewton		G 5
Bridgeboro		E 8
Briggston	35	F 9
Bright	150	D 2
Brighton	35	E 7
Brinson	248	C 9
Bristol	137	H 8
Broadhurst	225	J 8
Brobston	8	K 8
Bronwood	337	D 7
Brooker	50	G 7
Brookfield	350	F 8
Brooklet	536	J 6
Brooklyn	300	C 6
Brooks	136	D 4
Brookton	200	E 2
Browns Crossing	50	F 4
Broxton	800	G 7
Brunswick	17 954	K 8
Buchanan	651	H 3
Buckhead	240	F 3
Buena Vista	1 428	C 6
Buford	3 812	D 2
Bullard		F 5
Burnt Fort	75	J 9
Burtsboro	25	D 1
Burwell	60	B 3
Bushnell	27	G 7
Butler	1 182	D 5
Butts	10	J 5
Byromville	288	E 6
Byron	379	E 5
Cadwell	310	G 6
Cairo	5 577	D 9
Calhoun	3 231	B 1
Calvary	600	D 9
Calvin	50	F 6
Camak	379	G 4
Camilla	3 745	D 8
Camp Creek		D 1
Campania	350	H 4
Campton	163	E 3
Canon	596	F 2
Canoochee	63	H 5
Canton	2 716	C 2
Carbondale	75	E 3
Carl	214	E 3
Carlton	249	F 2
Carnegie	197	C 7
Carnesville	349	F 2
Carrollton	7 753	C 3
Carrs Station	50	F 4
Cartecay		D 1
Carters	35	C 1
Cartersville	7 270	C 2
Cass		C 2
Cassandra	125	B 1
Cassville		C 2
Cataula	500	C 5
Cave	8	C 2
Cave Spring	959	B 2
Cecil	254	F 8
Cedar Grove	75	A 1
Cedar Springs		C 8
Cedartown	9 470	B 2
Center	113	F 2
Centralhatchee	239	B 4
Chalybeate Spra	255	C 5
Chamblee	3 445	D 3
Charing	20	D 6
Charles	1 214	*H 6
Chatsworth	3 000	C 1
Chattahoochee	348	C 3
Chauncey		F 6
Cherrylog	315	D 1
Chester	1 747	F 6
Chickamauga	817	B 1
Chipley		C 5
Choestoe	210	E 1
Chula	100	E 7
Cisco	750	C 1
Clarkdale	1 106	C 3
Clarkesville	1 165	F 1
Clarkston	1 923	D 3
Clayton	17	J 6
Clayhill	1 302	F 1
Clayton	400	B 3
Clem		B 3
Clermont	323	E 2
Cleveland	589	E 1
Climax	373	D 9
Clinchfield	200	E 6
Clito	25	J 5
Cloudland	100	A 1
Clyattville	75	F 9
Clyo	600	K 6
Cobb	150	E 7
Cohbtown	288	H 6
Cobbville	126	G 7
Cobert		F 2
Cochran	3 357	F 6
Coffee	200	H 7
Coffinton		C 6
Cogdell		G 8
Cohutta	450	C 1
Colbert	407	F 2
Coleman	295	C 7
Coleman	45	G 4
Colesburg	100	J 9
College Park	14 535	C 3
Collegeboro	1 000	J 6
Collins	638	H 6
Colon	25	G 9
Colquitt	1 864	C 8
Columbus	79 611	C 8
Comer	882	F 2
Commerce	3 351	F 2
Concord	360	D 4
Conyers	2 004	D 3
Coolidge	764	E 8
Coosa	125	B 2
Cordele	9 462	E 7
Corinth	135	B 4
Cork	50	E 4
Cornelia	2 424	E 1
Cotton	146	D 8
Council	125	G 9
Covena		H 6
Coverdale	50	E 7
Covington	5 192	F 3
Covington Mills		E 3
Crandall	202	C 1
Crawford	555	F 3
Crawfordville	966	G 3
Crest	96	D 5
Crosland	127	E 8
Crystal Springs		B 2
Culloden	261	D 5
Culverton	250	G 4
Cumming	1 264	D 2
Curryville	54	B 2
Cusseta	571	C 6
Cuthbert	4 025	C 7
Cutting	100	G 8
Cyrene	35	C 9
Dacula	369	E 3
Dahlonega	2 152	D 1
Daisy	193	J 6
Dakota	40	E 7
Dallas	1 817	C 3
Dalton	15 998	B 1
Damascus	402	C 8
Dames Ferry	225	E 4
Danburg	191	G 3
Danielsville	298	D 2
Danville	461	F 5
Darien	1 380	K 8
Dasher	100	F 9
Davisboro	469	G 5
Dawson	4 411	D 7
Dawsonville	318	D 2
De Soto	309	D 7
Dearing	325	H 4
Decatur	21 635	D 3
Deepstep	159	G 4
Demorest	1 166	F 1
Dennis	50	F 4
Denton	273	G 7
Devereux	170	F 4
Dewey Rose	375	G 2
Dewitt		D 8
Dexter	264	G 6
Dial	89	D 1
Dickey	135	C 7
Dillard	186	F 1
Dixie	261	E 9
Doctortown	350	J 7
Doerun	902	E 8
Dolce	125	E 7
Donalsonville	2 569	C 8
Donovan	225	G 5
Doogan	30	C 1
Dooling	300	E 6
Doraville	472	D 3
Dorchester	150	K 7
Double Branches	100	H 3
Doublerun		E 7
Douglas	7 428	G 7
Douglasville	3 400	C 3
Dover	150	J 5
Doverel	25	D 7
Doyle		D 6
Draketown	200	B 3
Dry Branch	250	F 5
Du Pont	285	G 9
Dublin	10 232	G 5
Ducktown	58	D 2
Dudley	272	F 5
Due	50	D 1
Duluth	842	D 2
Dunwoody	240	D 3
Durand	186	C 5
Dyas	12	E 5
Early	100	B 2
East Ellijay	549	C 1
East Juliette	303	E 4
East Point	21 080	C 3
E. Thomaston	3 082	D 5
Eastanollee	225	F 1
Eastman	3 597	F 6
Eastville	96	F 3
Eatonton	2 749	F 4
Echeconnee	56	E 5
Eden	300	K 6
Edison	1 247	C 7
Edith	150	G 9
Egypt		K 6
Elberton	6 772	G 2
Eldora	50	J 6
Eldorendo	250	C 8
Elko	188	E 6
Ella Gap		C 1
Ellabell	100	K 6
Ellaville	886	D 6
Ellenton	429	E 8
Ellenwood	250	D 3
Ellerslie	650	C 5
Ellijay	1 527	C 1
Elmodel	125	D 8
Emerson	508	C 2
Emma	135	D 1
Emmalane	10	H 5
Empire	157	F 6
Enigma	499	F 8
Epworth	100	D 1
Erick	20	G 6
Esom Hill	175	B 3
Eton	297	C 1
Eulonia		K 7
Evans	1 750	H 3
Everett	200	J 8
Experiment	4 265	D 4
Fareville	700	C 9
Fairburn	1 889	C 3
Fairfax		G 8
Fairmount	573	C 2
Fargo		G 9
Farmdale		J 5
Farmington	121	F 3
Farrar	30	E 4
Fayetteville	1 032	C 4
Felton	250	B 3
Fender	150	E 8
Ficklin	100	G 3
Findlay	50	E 8
Finleyson	79	F 6
Fish	200	B 2
Fitzgerald	8 130	F 7
Fitzpatrick	150	F 5
Fleming	200	K 7
Flemington	90	J 7
Flint		D 8
Flintstone	200	B 1
Flippen	500	D 3
Florence		C 6
Flovilla	315	E 4
Flowery Branch	610	E 2
Folkston	1 515	H 9
Forest Glen		F 7
Forest Park	2 653	D 3
Forsyth	3 125	F 4
Fort Gaines	1 339	C 7
Fort Lamar	15	F 2
Fort Mudge	25	H 8
Fort Oglethorpe	692	*B 1
Fort Screven	300	L 8
Fort Valley	6 820	E 5
Fortson	300	C 5
Fowlstown	300	D 9
Franklin	425	B 4
Franklin Spra	182	F 2
Frolona	123	B 4
Fry	250	D 1
Fullerville	529	C 3
Funston	233	E 8
Gabbettville	275	B 5
Gaddistown	175	D 1
Gaillard	50	D 5
Gainesville	11 938	E 2
Garden City	1 557	K 6
Gardi	225	J 7
Gardners	150	G 5
Garfield	213	H 5
Gay	241	C 4
Geneva	209	C 5
Genola (W Georgia College)	700	B 3
Georgetown	550	B 7
Gibson	480	G 4
Gillsville	152	E 2
Girard	244	J 4
Glenmore	30	H 8
Glenn		B 4
Glennville	2 327	J 7
Glenwood	684	G 6
Gloster	100	D 3
Godfrey	168	F 4
Godwinsville	100	F 6
Goggins	130	D 4
Good Hope	189	E 3
Gordon	1 781	F 5
Gore	65	B 2
Gough	450	H 4
Gracewood	1 050	H 4
Graham	160	H 7
Grangerville	25	J 8
Grantville	1 359	C 4
Gratis	70	F 3
Graves	200	C 7
Gray	866	F 4
Graymont (Twin City)	1 018	H 5
Grayson	227	E 3
Graysville	120	B 1
Greenbush	150	B 1
Greenough		D 8
Greensboro	2 688	F 3
Greenville	733	C 4
Gregga	4	F 8
Gresham ville	100	F 3
Gresston	200	F 6
Griffin	13 982	D 4
Griswoldville		F 5
Grovania	225	E 6
Groveland	140	J 6
Grovetown	500	H 4
Guyton	633	K 6
Habersham	750	F 1
Haddock	475	F 4
Hagan	525	J 6
Hahira	1 010	F 9
Halcyon Dale	330	J 5
Hamilton	449	C 5
Hammett	15	D 5
Hampton	884	D 4
Hanlin	50	C 3
Hapeville	8 560	D 3
Haralson	142	C 4
Hardwick	3 000	F 4
Harlem	1 033	H 4
Harris	250	C 5
Harrison	281	G 5
Hartsfield	113	E 8
Hartwell	2 964	G 2
Hatcher	60	B 7
Hatley	100	E 7
Hawkinsville	3 342	E 6
Haylow		G 9
Hayner	20	J 8
Haywood	20	H 8
Hazlehurst	2 687	G 7
Headlight	4	G 9
Heardmont	65	G 2
Hebardville	1 113	H 8
Helen	191	E 1
Helena	1 027	G 6
Hephzibah	524	H 4
Hermitage	25	B 3
Herndon	300	H 5
Herod	126	D 7
Hiawassee	375	F 1
Hickox	139	H 8
Higgston	155	G 6
High Shoals		F 3
High Tower	75	D 2
Hill City	100	C 1
Hillsboro	300	E 4
Hilltonia	318	J 5
Hilton		C 8
Hinesville	1 217	J 7
Hinsonton		D 8
Hiram	299	C 3
Hoboken	492	H 8
Hogansville	3 769	C 4
Holland	300	B 2
Holly Springs	346	D 2
Hollywood	100	E 1
Homeland	278	H 9
Homer	340	F 2
Homerville	1 797	G 8
Homestead	13	H 8
Hortense	175	J 8
Hoschton	378	E 2
Howard		D 5
Howell	169	F 9
Huching	145	F 3
Hull	153	F 2
Hunters	60	K 5
Huntington	100	D 6
Hurst	195	D 1
Ideal	318	D 6
Ila	225	F 2
Inaha	100	E 7
Indian Springs	200	E 4
Inman	300	D 4
Iron City	293	C 8
Irwinton	700	F 5
Irwinville	275	F 7
Isle of Hope	500	K 7
Ivey	46	F 5
Jackson	2 053	E 4
Jacksonville	300	G 7
Jakin	264	B 8
James	150	E 5
Jasper	1 380	D 2
Jefferson	2 040	F 2
Jeffersonville	747	F 5
Jenkinsburg	168	E 4
Jersey	182	E 3
Jesup	4 605	J 7
Jewell	200	G 4
Jimps	25	J 6
Johntown	8	D 1
Jonesboro	1 741	D 4
Julia		C 6
Juliette	283	F 4
Junction City	259	C 5
Juniper	150	C 6
Juno	30	D 2
Kathleen	100	K 6
Kenbsburg	150	C 2
Kelly	100	E 4
Kennesaw	564	C 2
Kenwood	300	D 3
Keysville	304	H 4
Kibbee	100	H 6

*No room on map for name


TENNESSEE
NORTH CAROLINA
SOUTH CAROLINA
CHATTANOOGA
SPARTANBURG
GREENVILLE
Anderson
Clinton
Newberry
Greenwood
COLUMBIA
AUGUSTA
ATLANTA
Decatur
Athens
Augusta
Savannah
Macon
Columbus
Dalton
Rome
Gainesville
Elberton
Washington
Sandersville
Louisville
Waynesboro
Millen
Statesboro
Dublin
Eastman
Hazlehurst
Douglas
Valdosta
Thomasville
Albany
Cordele
Tifton
Moultrie
Bainbridge
Donalsonville
Blakely
Colquitt
Camilla
Pelham
Quitman
Nahunta
Brunswick
Jesup
Waycross
Folkston
Homerville
Alma
Hazlehurst
Lake Seminole
Okefenokee Swamp
Suwannee River
Withlacoochee River
Alapaha River
Ocmulgee River
Oconee River
Altamaha River
Ogeechee River
Savannah River
Chattahoochee River
Flint River
Tallapoosa River
Coosa River
Etowah River
Conasauga River
Toccoa River
Tugaloo River
Keowee River
Seneca River
Broad River
Saluda River
Catawba River
Yadkin River
Pee Dee River
Lake Hartwell
Lake Russell
Lake Richard B. Russell
Lake Thurmond
Lake Strom Thurmond
Lake Greenwood
Lake Murray
Lake Marion
Lake Moultrie
Lake Blackshear
Lake Seminole
Lake Okefenokee
Lake Sinclair
Lake Oconee
Lake Jackson
Lake Lanier
Lake Allatoona
Lake Weiss
Lake Rome
Lake Chatuge
Lake Nottely
Lake Blue Ridge
Lake Burton
Lake Rabun
Lake Tugalo
Lake Yonah
Lake Hartwell
Lake Keowee
Lake Jocassee
Lake Tugaloo
Lake Seneca
Lake Hartwell
Lake Russell
Lake Richard B. Russell
Lake Thurmond
Lake Strom Thurmond
Lake Greenwood
Lake Murray
Lake Marion
Lake Moultrie
Lake Blackshear
Lake Seminole
Lake Okefenokee
Lake Sinclair
Lake Oconee
Lake Jackson
Lake Lanier
Lake Allatoona
Lake Weiss
Lake Rome
Lake Chatuge
Lake Nottely
Lake Blue Ridge
Lake Burton
Lake Rabun
Lake Tugalo
Lake Yonah
Lake Hartwell
Lake Keowee
Lake Jocassee
Lake Tugaloo
Lake Seneca


GEORGIA
SCALE OF MILES
State Capitals
County Seats
Railroads
Copyright by C. S. Hammond & Co. N. Y.
ATLANTIC OCEAN
GULF OF MEXICO
APALACHEE BAY
FLORIDA
OKEFENOKEE
SWAMP
Deadmans Bay
Longitude West of 83° Greenwich
SAVANNAH
Brunswick
Waycross
Valdosta
Thomasville
Albany
Americus
Columbus
Phenix City
Dothan
Eufaula
Tallahassee
Jacksonville
Gainesville
Lake City
Live Oak
Fernandina Beach
Neptune Beach
Jacksonville Beach
Cumberland I.
St. Catherines I.
Sapelo I.
Ossabaw I.
Bainbridge
Chattahoochee
Moultrie
Douglas
Baxley
Hazlehurst
Vidalia
Lyons
Statesboro
Montezuma
Dawson
Cuthbert
Blountstown
Apalachicola
Marianna
STEWART
WEBSTER
SUMTER
DOOLY
MACON
HOUSTON
PULASKI
DODGE
WILCOX
TELFAIR
JEFF DAVIS
APPLING
BACON
WAYNE
PIERCE
BRANTLEY
GLYNN
McINTOSH
LIBERTY
LONG
EVANS
TATTNALL
TOOMBS
BRYAN
CHATHAM
EFFINGHAM
CANDLER
TREUTLEN
MONTGOMERY
WHEELER
LAURENS
BLECKLEY
SCHLEY
MARION
CHATTAHOOCHEE
QUITMAN
RANDOLPH
TERRELL
LEE
CLAY
CALHOUN
DOUGHERTY
EARLY
BAKER
MITCHELL
MILLER
SEMINOLE
DECATUR
GRADY
THOMAS
BROOKS
LOWNDES
COLQUITT
WORTH
TURNER
BEN HILL
IRWIN
TIFT
COOK
BERRIEN
LANIER
COFFEE
ATKINSON
CLINCH
ECHOLS
WARE
CHARLTON
CAMDEN
CRISP
State Capitals
County Seats

GEORGIA — *Continued*

Kildare	75	K 5
Killen	40	C 7
Kimbrough	100	C 7
Kingsland	1,169	J 9
Kingston	675	C 2
Kinlaw	35	J 9
Kirkland	100	G 8
Kite	447	G 5
Knoxville	400	E 5
La Cross		D 6
La Fayette	4,884	B 1
La Grange	25,025	B 4
Ladds	75	C 2
Lake Park	334	F 9
Lake Tara	224	*D 3
Lakeland	1,551	F 8
Lakemont	500	F 1
Lanier	100	J 6
Lavonia	1,766	F 2
Lawrenceville	2,932	D 3
Lax	100	F 8
Leaf	251	E 1
Leah	200	H 3
Leary	721	C 8
Leathersville		H 3
Lebanon	200	D 2
Lee Pope	75	E 5
Leesburg	659	D 7
Lenox	789	F 8
Leslie	417	D 7
Lewiston		F 5
Lexington	514	F 3
Lexsy	75	H 6
Lilburn	567	D 3
Lilly	177	E 6
Lincolnton	1,315	H 3
Lindale	2,834	B 2
Linton	150	F 4
Linwood	858	B 1
Linwood	100	B 2
Lisbon	95	G 3
Lithia Springs		C 3
Lithonia	1,538	D 3
Little River	80	G 3
Lizella	350	E 5
Loco		G 3
Locust Grove	405	D 4
Loganville	699	E 3
Lollie (Minter)	143	G 6
Lone Oak	120	C 4
Lookout		B 1
Lorane		E 5
Louisville	2,231	H 4
Louvale		C 6
Lovejoy	204	D 4
Lovett	80	G 5
Lucile	50	C 8
Lucius		D 1
Ludowici	1,332	J 7
Ludville		C 2
Luella	200	D 4
Lula	378	E 2
Lumber City	1,232	G 7
Lumpkin	1,209	C 6
Luthersville	312	C 4
Lyerly	524	B 2
Lynn		J 7
Lynn Station	25	C 8
Lyons	2,799	H 6
Machen	40	E 4
Macon	70,252	E 5
Madison	2,489	F 3
Madras	185	C 4
Manassas	128	H 6
Manchester	4,036	C 5
Manor		G 8
Mansfield	446	E 4
Marblehill		D 2
Margret	145	D 1
Marietta	20,687	D 3
Marion		D 1
Marlow	250	K 6
Marshallville	1,121	D 6
Martin	207	F 2
Martinez	2,560	H 3
Matthews	100	H 4
Mauk	100	D 6
Maxeys	204	F 3
Maxim	25	H 3
Mayfield	250	G 4
Maysville	533	E 2
McBean	200	J 4
McCaysville	2,067	D 1
McCollum	100	C 4
McDonough	1,635	D 4
McIntosh		K 7
McIntyre	194	F 5
McKinnon	65	J 8
McRae	1,904	G 6
McWhorter	45	C 3
Meansville	224	D 4
Meda	20	F 4
Meeks	100	G 5
Meigs	1,125	D 8
Meinhard	160	K 6
Meldrim	250	K 6
Mendes	300	H 7
Menlo	453	B 2
Meridian		K 8
Merrillville	109	E 9
Mershon		H 8
Mesena	150	G 4
Metasville	82	G 3
Metcalf	206	E 9
Metter	2,091	H 6
Middleton	144	G 2
Midland	200	C 5
Midville	682	H 5
Midway	228	K 7
Milan	750	G 6
Milford		C 8
Milledgeville	8,835	F 4
Millen	3,449	J 5
Millhaven	50	J 5
Millwood		G 8
Milner	345	D 4
Milstead	1,075	D 3
Mineral Bluff	209	D 1
Minter (Lollie)	143	G 6
Mitchell	240	G 4
Mize	75	F 2
Modoc	32	*H 5
Molena	307	D 4
Moniac	200	H 9
Monroe	4,542	E 3
Montezuma	2,921	E 6
Monticello	1,918	E 4
Montrose	242	F 5
Moran	250	E 5
Moreland	306	C 4
Morgan	304	C 7
Morganton	244	D 1
Morris		C 7
Morrow	326	*D 3
Morven	474	E 9
Moultrie	11,639	E 8
Mt. Airy	416	F 1
Mt. Berry	1,500	B 2
Mt. Pleasant	50	J 8
Mt. Vernon	990	H 6
Mt. Zion	141	B 3
Mountain City	524	F 1
Mountain Park	15	*D 3
Mountville	142	C 4
Moxley	50	H 5
Munnerlyn	75	H 5
Murrayville	1,000	E 2
Musella	68	E 5
Mystic	281	F 7
Nacoochee	250	E 1
Nahunta	739	H 8
Nankipooh	100	C 5
Nashville	3,414	F 8
Natal		E 1
Naylor	290	F 9
Neal	50	D 4
Nelson	645	D 2
Nevils	160	J 6
New Holland	1,618	E 2
New Lacy	25	H 7
Newborn	298	E 3
Newington	429	J 5
Newman	8,218	C 4
Newton	503	D 8
Nicholls	806	G 7
Nicholson	252	F 2
Noble	200	B 1
Norcross	1,340	D 3
Norman Park	832	E 8
Normantown	78	H 6
Norristown	150	H 5
N. Atlanta	5,930	*D 3
N. High Shoals	124	*F 3
Norwood	268	G 4
Nuberg	273	G 2
Nunez	82	H 5
Oak Hill	50	D 1
Oak Park	308	H 6
Oakfield	108	E 7
Oaklawn	75	E 9
Oakman	127	C 1
Oakwood	225	E 2
Oasis	15	G 4
Ochlochnee	503	E 9
Ocilla	2,697	F 7
Oconee	1,500	G 5
Odessa	5	J 7
Odessadale	55	C 5
Odum	389	H 8
Offerman	500	H 8
Ogeechee	40	J 5
Oglesby	15	G 2
Oglethorpe	1,204	D 6
Ohoopee	53	H 6
Ola	100	E 4
Oliver	223	J 5
Omaha	217	C 6
Omega	966	E 8
Oostanaula	50	B 1
Ophir	40	D 2
Orange	50	D 2
Orchard Hill	82	D 4
Orland	40	G 6
Oscarville	25	E 2
Osierfield	147	F 7
Ousley	35	F 9
Owen	50	H 8
Oxford	817	E 3
Padena	105	D 1
Palmetto	1,257	C 3
Parish	15	J 6
Parrott	291	D 7
Patterson	656	H 8
Pavo	806	E 9
Payne	520	E 5
Pearson	1,402	G 8
Pelham	4,365	D 8
Pembroke	1,171	J 6
Pendergrass	189	E 2
Penfield	74	F 3
Penia	50	E 7
Pennick	300	J 8
Pepperton	572	E 4
Perkins	210	J 5
Perry	3,849	E 6
Persimmon	70	E 1
Philomath	200	G 3
Pickard	150	D 5
Pidcock	100	E 9
Piedmont	34	D 4
Pike	44	D 1
Pine Grove	135	H 7
Pine Lake	566	*D 3
Pine Log		C 2
Pine Park	126	D 9
Pinehurst	430	E 6
Pineora	450	K 6
Pineview	310	F 6
Pisgah		D 1
Pitts	397	E 7
Pittsburg	40	B 1
Plainfield	117	F 6
Plains	546	D 6
Plainville	142	C 2
Pocotalago	68	F 2
Point Peter	100	F 3
Pooler	818	K 6
Pope City		F 6
Port Wentworth	1,500	K 6
Portal	532	J 5
Porter Sprs.	125	E 1
Porterdale	3,207	E 3
Portland	300	C 2
Poulan	750	E 8
Powder Sprs.	619	C 3
Powelton	50	G 4
Powersville	100	E 5
Prattsburg	50	D 5
Preston	260	C 6
Pridgen	200	G 7
Primrose	24	C 4
Princeton	100	F 3
Priors	50	B 2
Pulaski	234	J 6
Putnam	60	D 6
Putney	200	D 8
Quill		D 1
Quitman	4,769	E 9
Rabun Gap	250	F 1
Racepond	158	H 8
Rahns		K 6
Raleigh	48	C 5
Ramhurst	100	C 1
Randolph		C 7
Ranger	183	C 2
Ray City	576	F 8
Raybon		H 8
Rayle	300	G 3
Raymond	200	C 4
Rebecca	295	E 7
Recovery	100	C 9
Red Oak	675	C 3
Register	300	J 6
Reidsville	1,266	H 6
Relay	100	B 2
Relee		G 7
Remerton	500	F 9
Renfroe	56	C 6
Reno	108	D 9
Rentz	302	G 6
Resaca	300	C 1
Rest Haven	147	*D 3
Reynolds	906	D 5
Rhine	514	F 7
Riceboro	267	K 7
Richland	1,571	C 6
Richmond Hill	500	K 7
Richwood	75	E 6
Riddleville	106	G 5
Ridgeville		K 8
Rincon	424	K 6
Ringgold	1,192	B 1
Rising Fawn	300	A 1
Riverdale	263	D 3
Riverside	395	E 8
Roberta	673	D 5
Robertstown	150	E 1
Robinson	75	B 2
Rochelle	1,697	F 7
Rockingham	60	H 7
Rockledge	100	G 6
Rockmart	3,821	C 2
Rockville	30	F 4
Rocky Face	300	C 1
Rocky Ford	278	J 5
Rocky Mount	27	*C 4
Rome	29,615	B 2
Roopville	202	B 4
Rosebud	100	D 3
Rosier	125	H 5
Rossville	3,899	B 1
Roswell	2,123	D 2
Round Oak	165	E 4
Rowell	45	B 2
Rowena	200	C 8
Roy	15	D 1
Royston	2,039	F 2
Ruckersville	74	G 2
Rupert		D 6
Russell	129	E 3
Ruth	200	F 4
Rutland		E 5
Rutledge	482	E 3
Rydal	100	C 2
St. Charles		C 4
St. Clair	150	H 4
St. George	582	H 9
St. Marks	43	C 4
St. Marys	1,348	J 9
St. Simons I.	1,706	K 8
Sale City	289	D 8
Sandersville	4,480	G 5
Sapelo Island	307	K 8
Sarah	75	D 1
Sardis	695	J 5
Sargent	1,250	C 4
Sasser	371	D 7
Satolah	165	F 1
Sautee	314	E 1
Savannah	119,638	L 6
Savannah Beach	1,036	L 7
Scarboro	150	J 5
Scotland	218	G 6
Scott	194	G 5
Screven	752	H 7
Sea Island	500	K 8
Sells	30	E 2
Seney	50	B 2
Senoia	770	C 4
Sessoms	100	G 8
Seville	187	E 7
Shady Dale	253	E 4
Shannon	1,676	B 2
Sharon	224	G 3
Sharpsburg	133	C 4
Shell Bluff	20	J 4
Shellman	1,090	C 7
Shiloh	250	C 5
Shingler		E 7
Siloam	324	F 3
Silver City	150	D 2
Silver Creek	400	B 2
Silvertown	3,387	D 5
Smarr	100	E 5
Smithonia	80	F 2
Smithville	676	D 7
Smyrna	2,005	D 3
Snellville	309	D 3
Social Circle	1,685	E 3
Sofkee		E 5
Soperton	1,667	G 6
South Georgia	650	G 8
South Newport	50	K 7
Sparks	887	F 8
Sparta	1,954	F 4
Spring Place	214	C 1
Springfield	627	K 6
Springvale	127	C 7
Sprite	25	B 2
Stapleton	355	H 4
Statenville	1,000	G 9
Statesboro	6,097	J 6
Statham	626	E 3
Stellaville	69	H 4
Stephens	100	F 3
Sterling	30	K 8
Stevens Crossing		H 5
Stevens Pottery		F 5
Stilesboro		B 2
Stillmore	420	H 6
Stilson	165	J 6
Stockbridge	717	D 3
Stockton	300	G 9
Stone Mtn.	1,899	D 3
Stonewall	510	C 3
Stovall	150	C 5
Stuckey	150	G 6
Subligna	152	B 1
Suches		E 1
Sugar Hill	783	*D 3
Sugar Valley	214	C 1
Sulphur Sprs.	175	A 1
Summertown	137	H 5
Summerville	3,973	B 2
Sumner	226	E 7
Sumter	40	D 7
Sunny Side	169	D 4
Suomi	40	G 6
Surrency	295	H 7
Suwanee	357	E 2
Swainsboro	4,300	H 5
Swords	35	F 3
Sycamore	624	E 7
Sylvania	2,939	J 5
Sylvester	2,623	E 7
Talbotton	1,175	C 5
Talking Rock	94	D 1
Tallapoosa	2,826	B 3
Tallulah Falls	239	F 1
Tallulah Park		F 1
Talmo	152	E 2
Talona	41	C 1
Tarboro	180	J 8
Tarrytown	250	H 6
Tarver		G 9
Tate	100	D 2
Taylorsville	260	C 2
Tazewell	105	D 6
Temple	676	B 3
Tennra	200	C 1
Tennille	1,713	G 5
Texas	40	B 4
Thalmann	150	J 8
The Rock	147	D 5
Thomasboro	30	J 5
Thomaston	6,580	D 5
Thomasville	14,424	E 9
Thomson	3,489	H 4
Thunderbolt	1,238	K 6
Tifton	6,831	F 8
Tiger	269	F 1
Tignall	502	G 3
Tilton	100	B 1
Tippettville	50	E 6
Titus	200	E 1
Toccoa	6,781	F 1
Toledo	134	H 9
Toomsboro	711	F 5
Towns	96	G 7
Townsend		J 7
Trenton	755	A 1
Trimble	150	C 4
Trion	3,028	B 1
Troutman	25	C 7
Tugalo	25	F 1
Tunnel Hill		C 1
Turin	185	C 4
Tusculum	100	K 6
Twin City (Graymont)	1,018	H 5
Ty Ty	478	E 8
Tyrone	156	C 4
Unadilla	1,098	E 6
Union City	1,490	D 3
Union Point	1,724	F 3
Upatoi	300	C 5
Uvalda	511	H 6
Valdosta	20,046	F 9
Valona	50	K 8
Van Wert		B 3
Vanna	145	F 2
Varnell	500	C 1
Vaughn	100	D 4
Veazey	40	F 3
Vidalia	5,819	H 6
Vidette	159	H 4
Vienna	2,202	E 6
Villa Rica	1,703	C 3
Villanow	150	B 1
Waco	328	B 3
Wade		H 5
Wadley	1,624	H 5
Walburg	4	J 8
Walden	100	E 5
Waleska	385	D 2
Walker Park	150	E 3
Walnutgrove	121	E 3
Waltertown	2	H 8
Walthourville	300	J 7
Waresboro		H 8
Warm Springs	557	C 5
Warner Robins	7,986	E 5
Warrenton	1,442	G 4
Warsaw		K 7
Warthen	240	G 4
Warwick	449	E 7
Washington	3,802	G 3
Watkinsville	662	E 3
Waverly	100	J 8
Waverly Hall	690	C 5
Waycross	18,899	H 8
Waynesboro	4,461	J 4
Waynesville		J 8
Wayside	150	E 4
Wenona	75	E 7
Wesley	66	H 6
W. Bainbridge	3,000	C 9
W. Georgia College (Genola)	700	B 3
W. Green		G 7
W. Point	4,076	B 5
Westlake		F 5
Weston	162	C 7
Westwood	75	F 7
Whigham	471	D 9
White	454	C 2
White Hall	493	F 3
White Oak	150	J 8
White Plains	359	F 4
White Sulphur Sprs.	32	*C 5
Whitepath	100	D 1
Whites Mill	5	C 9
Whitesburg	400	B 4
Whitestone		D 1
Whitesville	100	C 5
Wiley	125	F 1
Willacoochee	987	G 8
Willard	25	F 4
Williamson	211	D 4
Winchester	25	E 6
Winder	4,604	F 2
Winfield	25	H 3
Winokur	100	H 6
Winston	154	C 3
Winterville	453	F 3
Woodbine	750	J 9
Woodbury	985	C 5
Woodcliff	175	J 5
Woodland	621	D 2
Woodstock	545	D 2
Woodville	484	F 3
Woolsey	90	D 4
Worth		E 7
Wray	45	F 7
Wrayswood	30	F 3
Wrens	1,389	H 4
Wrightsville	1,750	G 5
Yahoolah	125	D 1
Yatesville	290	D 5
Yonkers	33	F 6
Young Harris	450	E 1
Youngcane	500	E 1
Youngs		B 3
Ypsilanti	35	D 5
Zebulon	539	D 4
Zeigler	100	J 5
Zenith	10	E 5

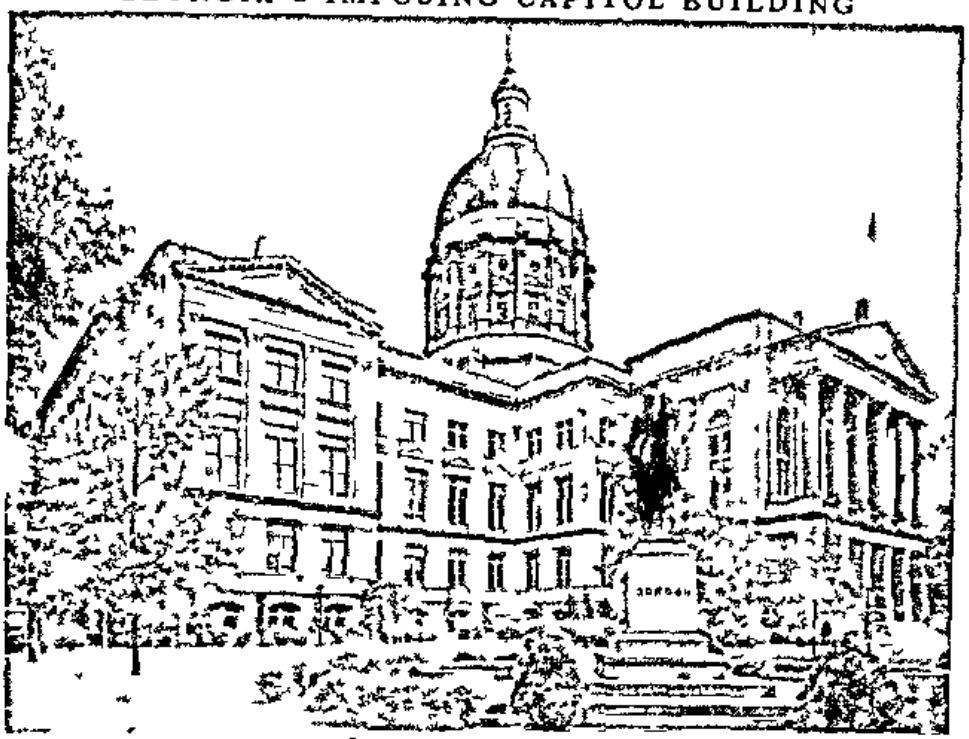
*No room on map for name.

ment engage about one out of every four workers in the state

Leading manufactures include cotton broadwoven goods and cotton yarn Other important textile products are hosiery and rayon and woolen fabrics Georgia is also noted for its sawmills and planing mills, gum and wood chemicals furniture and men s clothing

The largest of Georgia's cities is its capital Atlanta An inland crossroads at the southeastern end of the Appalachian Mountains, it is an important trade manufacturing and transportation center It is noted for its historical associations (*see* Atlanta)

GEORGIA'S IMPOSING CAPITOL BUILDING



The Capitol at Atlanta has a modified Grecian architectural design and is built of Indiana limestone The interior is finished in Georgia marble The structure was completed in 1889 In the foreground is the equestrian statue of Gen John B Gordon first governor to occupy the Capitol

The state s second city and main port is Savannah near the mouth of the Savannah River This beautiful city is the oldest in the state and rich in historic interest It is also a busy south Atlantic port (*see* Savannah) Farther up the river is Augusta It has large cotton and lumber markets and many cotton mills Within 25 miles are the vast Savannah River Plant of the Atomic Energy Commission in South Carolina the United States Army's Camp Gordon and Clark Hill Dam which provides a nine-foot channel to the city (*see* Augusta) Across the state is Columbus, an industrial center on the Chattahoochee River

About 100 miles southeast of Atlanta and only six miles from the geographical center of the state is Macon A great dam on the Ocmulgee River provides hydroelectric power for the city s cotton knitting, lumber, and other mills Macon was the home of Sidney Lanier well known Southern lyric poet It is the seat of Wesleyan College one of the first women's colleges in the United States

History of Georgia

About 1540 Hernando de Soto and his company of adventurers, lured by tales of fabulous wealth in the New World passed through what is now Georgia on their way to the Mississippi (*see* De Soto) In 1566 Menéndez de Avilés landed on St Cathernes Island Thus Georgia became part of the vast territory which Spain claimed During the next two centuries, the Spaniards established only a few scattered forts along the coast They had to defend their title constantly against the claims of the French in Louisiana and the English in the Carolinas

In 1732 George II for whom the state was named, granted a charter to a group of wealthy Englishmen headed by Gen James Edward Oglethorpe They planned to found a colony as a haven for debtors who were crowding English prisons and for persecuted Protestants in Germany and Austria The colony was also to serve as a defense area against the Spaniards in Florida and the French in Louisiana

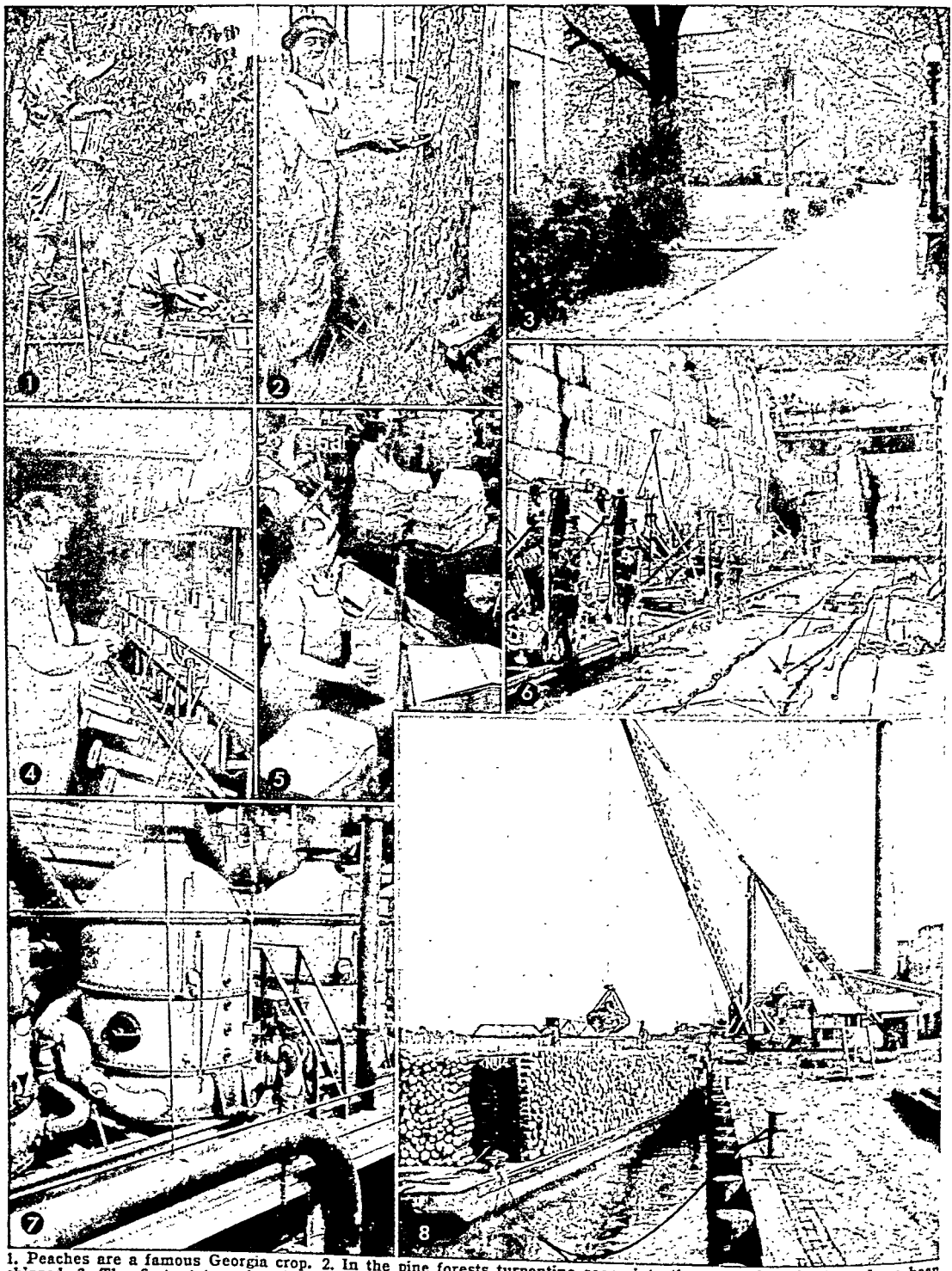
In the spring of 1733 General Oglethorpe, with about 150 followers sailed up the Savannah River to Yamacraw Bluff Here he built Fort Savannah and founded the colony of Georgia It was the last of the 13 colonies set up by England Soon afterward, the group was joined by bands of Protestant refugees, notably the Moravians and the Salzburgers Settlements were made at New Ebenezer, New Inverness, Frederica and Augusta

In 1734 Oglethorpe went back to England and in 1736 returned to Georgia He brought with him more colonists including 150 Scottish Highlanders

In July 1742 Spaniards from Florida landed 3 000 men on St Simon Island Their aim was to destroy the settlement at Frederica They were defeated at the battle of Bloody Marsh by Oglethorpe Still outnumbered by the invaders he cleverly informed the enemy that a British fleet was on its way to attack St Augustine The Spaniards returned to Florida

The Georgia settlers cultivated silkworms hemp, grapes, and olives for England But the colony did not thrive because the climate was warm and slaves were prohibited To save the colony, the trustees allowed slaves to be brought in beginning about 1749

GLIMPSES INTO THE HEART OF GEORGIA



1. Peaches are a famous Georgia crop. 2. In the pine forests turpentine seeps into the pans after the trees have been chipped. 3. The first state university to be chartered in the Union is at Athens. 4. Georgia's cotton supports a growing textile industry. 5. Paper mills of Savannah, fed by the pulp of Georgia's pine forests. 6. The famous quarry of fine marble near Tate. 7. From the cane fields comes the sugar for this refinery at Savannah. 8. Unloading logs from barges shows the importance of river navigation in the commerce of the state.

A GLIMPSE OF LUXURIANT GEORGIA VEGETATION



Near Brunswick the vegetation is typical of Georgia's coast The oaks, bearded with Spanish moss, frame the grass-filled savanna on each side of the river.

During these uncertain years, the Indians remained friendly until 1751. Then Mary Musgrove, an Indian woman who had acted as an interpreter for General Oglethorpe, marched against Savannah with a large band of Indians to demand the return of certain lands The uprising was quelled by William Stephans, Oglethorpe's successor

After the trustees surrendered their charter, the colony in 1754 became a royal province. It prospered under the liberal rule of its governors, John Reynolds, Henry Ellis, and James Wright

During the American Revolution, Georgians played a conspicuous part, rather because of their sympathy with the northern colonies than because they were dissatisfied with British rule In 1778 Georgia became the chief battlefield when the British, after failing to conquer the northern colonies, tried to gain a footing in the South The British routed the Americans under Gen. Robert Howe and seized Savannah The city became the headquarters of the British in the South

Georgia adopted its first state constitution in 1777 and it was the fourth state to ratify the federal Constitution Trouble with the Creek and Cherokee Indians, who resented the seizure of their lands, was a problem of the new state In 1802 Georgia, whose territory then included most of the present states of Alabama and Mississippi, sold to the federal government all its lands westward from the Chattahoochee to the Mississippi River The federal government negotiated Indian claims in 1832–35 By 1838 all Indians had been moved to distant reservations.

Georgia in the Civil War

At the beginning of the secession movement, Georgia was divided between Unionists, headed by the able Alexander H Stephens, and those who wished to leave the Union (*see* Civil War, American). When Abraham Lincoln was elected president, the state voted overwhelmingly for secession, Jan 19, 1861, and declared itself a free republic In 1863 it was the scene of the hard-fought battle of Chickamauga near the Tennessee border In 1864 General Sherman cut his way across Georgia, captured Atlanta, and then marched to the sea (*see* Sherman)

After peace came, Georgia recovered slowly from the war (*see* Reconstruction Period) It was readmitted into the Union on July 15, 1870 (For additional history, *see* chronology in Georgia Fact Summary.)

Higher Education in Georgia

All state-supported institutions of higher learning comprise the University System of Georgia The eight white senior colleges are University of Georgia at Athens, the nation's oldest chartered state university (1785), University System Center, Atlanta, nationally known Georgia Institute of Technology, Atlanta, Medical College of Georgia, Augusta, North Georgia College, Dahlonega, Georgia State College for Women, Milledgeville, Georgia Teachers College, Collegeboro, and Valdosta State College, Valdosta. There are also five white junior and three Negro senior colleges Near Atlanta are two leading private schools, Emory University and Oglethorpe University (*See also* United States, section "The South ")

GEORGIA. For more than 2,000 years, proud, courageous Georgia, also called Sakartvelo, maintained its own line of kings. Then in 1801 it was annexed to Russia, to which it had appealed for protection from the Turks; but in May 1918, after the Russian revolution, it again declared its independence In 1922, with Azerbaidzhan and Armenia, Georgia formed the Transcaucasian Socialist Federative Soviet Republic When this was abolished in 1936, it became a constituent republic (Georgian Soviet Socialist Republic) of the Soviet Union The Georgians are a handsome people of ancient white stock (*see* Caucasus Mountains)

Georgia lies on the Asiatic side of the Caucasus Mountains, bordering on the Black Sea The capital is the ancient city of Tbilisi (Tiflis), with a population of 540,000 Here are factories and important schools, notably the state university. The oil pipelines and the railroad from Baku to Batum, chief port of Georgia, pass through Tbilisi

Georgia leads the world in production of high-grade manganese ore It also mines coal, iron, and copper. Its important farm products are corn and other cereals, cotton, fruit, tobacco, and tea Cattle are fattened in its rich meadows, and silkworms in its mulberry plantations Fine timber is cut from the forests Power for industry comes from hydroelectric plants on the Kura River. Area of Georgia, about 27,000 square miles, population (1947 est.), 3,555,000.

GERANIUM. Botanists tell us that the red, white, or pink "geranium" plants we grow in summer gardens and on window sills really are not geraniums at all. They are pelargoniums. But real geraniums are found all over our woods and thickets. They are graceful wild flowers with five-petaled heads on long, hairy stems. Many of them look like wild roses. (For illustration in color, *see* Flowers.) We call them crane's-bills or wild geraniums. The spotted crane's-bill is about two feet high and each of its numerous branches bears two light purple flowers about an inch across. Its bitter rootstock is used as a medicine. Another common species is herb Robert, a plant with dainty, little, light purple flowers streaked with red, found in damp shady woods and ravines.

The house plants we call "geraniums"—the pelargoniums—belong to the same family but differ greatly from the true geranium in appearance. They are much prized for their large, irregular, variously colored flowers and their leaves that vary so in shape, texture, and marking. Geranium oil, a substitute for attar of roses, is distilled from certain species growing in Algeria and in Cape of Good Hope, where most of the plants of this genus have come from.

Both the geranium and the pelargonium belong to the plant family *Geraniaceae*. The geraniums number about 160 species, and are dispersed throughout the temperate regions of the world. The pelargoniums—the commonest of whose 200 species are the cultivated ivy geranium (*Pelargonium peltatum*), the rose geranium (*Pelargonium grateolens*), and the nutmeg geranium (*Pelargonium odoratissimum*)—are perennial herbs or shrubs.

The Language of LUTHER, GOETHE, *and* SCHILLER

GERMAN LANGUAGE AND LITERATURE. Rough and guttural though German may be, it somehow lends itself naturally to poetry. While German prose is often inclined to do anything but come "trippingly on the tongue," the best German verses are true music. They are alive with sincerity, they speak directly and unmistakably to the human soul, they strike deep to the very elements of life. And much of this wild-flower charm is apparently due to the vital quality of the language itself.

When we first meet with the Germans, or Teutons, about the beginning of the Christian era, they form three distinct groups with corresponding tongues—the East Germanic or Gothic, the North Germanic or Scandinavian, and the West Germanic, from which originated primitive German, English, Dutch, etc. This primitive German continued to split up into dialects as the tribes settled permanently in various districts; but the chief dialects were the High German of the mountainous region of central and southern Germany, and the Low German of the lowland country in the north. High German won out over the dialect of the plains, and it is High German which is the official and literary language of Germany today.

MARTIN LUTHER



His Translation of the Bible Fixed the Standard of German Prose.

SCHILLER



Lyric Poet, Dramatist, and Friend of Freedom.

German is really a simple and direct language, although it may present a formidable appearance to the beginner. The first difficulty lies in the old "Gothic" characters, in which most German books are printed. This alphabet is simply a variation of the Roman, and any word written in the former can be reproduced letter for letter in the latter script. Next, the beginner is struck by the enormous length of many German words. But these are due to the ease with which compounds are formed, and when such words are split up into their several parts, they prove not only easy to understand but have a remarkable gift of expression. Thus, the word "Volksschullehrerseminar" looks almost hopeless with its 23 letters, until we divide it thus: "Volks-schul-lehrer-seminar." Then we discover by translating it bit by bit that it means "public-school-teachers' seminary," or, in other words, a training college for elementary teachers.

The formation of such compounds gives an exactness of meaning which is often lost in looser English phrases. And when we add to this the practice, so common in German syntax, of reserving the verb or part of the verb for the end of the sentence, thus holding the reader's attention suspended until the *whole* of the thought has been expressed, we realize why German is so valuable a language for scientific descriptions of all sorts.

HEINE



A Sparkling Poet and Master of Wit and Irony.

The Roman historian Tacitus, writing in the year 98 A.D., tells us that already the German barbarians of that period had a poetry of their own. The warriors would advance to battle, he says, singing hymns to Thor, the god of thunder, their shields held before their mouths to clang out a greater volume

of sound And ever since no matter what refinements or complexities have developed in German literature there still remains in it this martial clang of shields the distant thunder of tribal religion a hard sonorous music larger and louder than life Even the sweetest of their folksongs have something at once vigorous and dark running through them

For a long time this ancient poetry remained unwritten or if fragments of it were carved now and then in the old Runic alphabet on wooden staffs and metal tablet it was soon lost or at best remained but fragments

Not until the 4th century do we find a book written in a Teutonic tongue and by that time it treated not of the gold Thor but of Christianity This book was a translation of the Bible made by Ulfilas the native missionary to the Goths In order to make this translation Ulfilas was obliged first to invent the Gothic alphabet combining Greek Latin and Runic letters to do so The tongue of those ancient Goths as we here find it possessed much of the rolling beauty and expressive roughness of the German language today

But though Ulfilas began the conversion of the Germans to the Christian religion their poets continued for centuries to sing of the old gods of Brunhild and Gudrun and the flying Valkyrs as well as of mighty historic figures such as Attila (Etzel) the Hun The Nibelungenlied of the 13th century is the most famous of these wild old dreams of gods and heroes and it has been the source of much modern German literature like a great changeless lake of rugged beauty and violent storms from which trickle delicate but more transient streams

A lighter note however tinkled alongside these resounding epics the music of the minnesongs or the love lyrics of romantic knighthood These dwindled out finally in the wholly mechanical mastersongs composed by rule rather than by inspiration and turned out like factory goods Yet the same period (15th and 16th centuries) in which these stiff and dreary mastersongs were being manufactured was the very heyday of the delightful German folksongs — simple abiding music by poets whose names are unknown

GOETHE—GERMAN LITERARY GENIUS



Here we see Johann Wolfgang Goethe instructing his son Statesman, dramatist poet and philosopher Goethe crowned his brilliant career by writing Faust often called the national poem of the German people

About this time also German prose began to develop and likewise German drama chiefly in the hands of the clergy Church plays grew into great and solemn spectacles of which the celebrated Passion Play of Oberammergau is an impressive survival And when the Reformation came in the church religion found even more beautiful expression in the fine old hymns of Martin Luther But it was Luther's translation of the Bible which had the most important effect This did for the German language what the works of Dante Petrarch and Boccaccio did for Italian or what the King James Bible did for English It fixed the standard of the language in the midst of a confusion of dialects Modern German dates largely from Luther's works

As the years went on religious disputes became angrier the Thirty Years War (1618-1648) broke out and the light of literature vanished in its horrors.

SCHOPENHAUER



A Philosopher Who Preached a Doctrine of Pessimism



STORM
Author of Novels about Village Life



NIETZSCHE
Philosopher of the Superman



SPENGLER
Philosopher Who Influenced Nazi Thought



HAUPTMANN
Creator of Realistic Drama

National feeling decayed, and a weak and war-torn generation imitated French thought and custom in almost every field of activity.

The Rebirth of German Literature

Not until the time of Frederick the Great (1712–1786) did German literature flourish again. Frederick himself was contemptuous of German writers. He preferred the French style of writing, and he honored the French writers, notably Voltaire, and such Englishmen as John Locke. But he did give Germans a sense of pride and independence, and gradually German writers broke away from French and English models.

Frederick began his reign in 1740. About the same time German literature began a golden age that lasted for a century. Klopstock, in his epic poem 'Der Messias' (The Messiah) and in his odes, introduced a new poetic language while still maintaining classic forms. Lessing, critic and dramatist, preached the harmony of form and content. He abandoned long, gusty descriptions and high-soaring allegory. His play 'Miss Sara Sampson' was the first German tragedy to introduce middle-class characters His 'Nathan the Wise' spoke bravely for understandings between different religions. Wieland was an epic poet and novelist. He pioneered free expression of emotion and edged in a new and neater wit.

A Literature of the People

These three writers, and others, were still guided by classic models and by the literary precepts of Aristotle's 'Poetics'. But for some time the ways of the world had been changing radically, and literature at last caught up with the change. A real middle class of people had already formed, and they wanted books, poems, and plays that expressed their own thoughts and feelings. The influence of Jean Jacques Rousseau was strong (*see* Rousseau). This French philosopher preached the dignity of the "natural man" and the rights of the individual. Germans received his ideas with enthusiasm.

Aided largely by the critical writings of Herder, Rousseau's theories produced in Germany the *Sturm und Drang* (Storm and Stress) movement. People began to talk of the perfect freedom of the individual and to rebel at tradition and authority. In France the movement led to revolution, but in Germany it had no political consequences.

In German literature, however, the effect was enormous. Goethe, the greatest of German authors, wrote several novels emphasizing this theme. Such books of his as 'The Sorrows of Young Werther' and 'Wilhelm Meister' tell of the struggles of young men for self-expression and of their emotional torments in first love affairs. Schiller, second only to Goethe among German writers, wrote in similar vein. (*See also* Goethe; Schiller.)

But in the work of lesser authors *Sturm und Drang* dwindled into uninspired sentimentalism, lacking the lofty concepts of Goethe and Schiller. It became fashionable to revel in a twilight mood of misery. Presently the sobering philosophy of Immanuel Kant restored order. Backed by stern Lutheran theology, Kant expressed a concept of duty and a call for reasonable action based on high moral principle (his doctrine of the Categorical Imperative). Goethe swung back to classic order as a result of his studies in Italy. His greatest work, 'Faust', represents a lifetime of thought on the problem of how good can conquer evil. Richter's ironic novels helped literature regain balance.

The Romantic Movement in Germany

Toward the close of the 18th century, the literature of England, France, and Germany entered a period now called the Romantic movement In general, it emphasized the expression of imagination, emotion, pleasure, experience, love of nature, and an interest in the past. It opposed all the restraint and order that classicism stood for.

In Germany, the Romantic movement was spurred by the work of the brothers Jakob and Wilhelm Grimm. They collected a vast number of German folk tales and awoke interest in the rich store of national tradition. The philosopher Fichte spoke for intuition as the underlying basis for reason, and Schelling proposed the imagination as a guide to life The Romantics were individualists, sometimes obscure and capricious. But they broke the restraints that had held poetry in a rigid mold and opened the broad vista of the past and of foreign thought to the provincial German mind.



TOLLER
Writer of
Impressionistic Plays



WERFEL
Reflective Poet
and Novelist



MANN
Profound Novelist
of Social Problems



REMARQUE
Writer of War
and Its Aftermath

The greatest of the German Romantics was Heinrich Heine As a lyric poet he was surpassed only by Goethe, as a master of wit and irony he held an equally high place His poems 'Du bist wie eine Blume' (Thou seemest like a flower) and 'The Lorelei' are among the most loved of German verses (*see* Heine)

Heine lived in the years of Germany s struggle against the rise of absolute monarchy The Revolution of 1848 was defeated by Prussian force But political defeat could not crush the rising spirit of freedom Schopenhauer s pessimistic but provoking philosophy appealed with new force and advances in science brought a materialistic attitude to life

In literature men turned from the "moon lit magic nights" of the Romanticists to the clearer light of day *Observation and objectivity* replaced feeling and subjectivity Two dramatists Friedrich Hebbel and Otto Ludwig were pathmakers in this more realistic style Richard Wagner sought a closer union between drama and music in his operas *Many novelists*, such as Alexis and Meyer, followed Walter Scott in writing historical novels Others wrote of peasant and village life Theodor *Storm's* village novel 'Immensee' bridged the gap between the waning Romanticism and the new realism

In the last decades of the *19th century*, the displacement of human labor by machinery industrialism and life in the big city meant poverty and suffering to many people There was conflict *in the thought* of the time On the one hand Nietzsche was expressing his doctrine of the value of the individual *and the* coming of the superman On the other, men were *studying social conditions and trying* to make life less hard for the lower classes At the same *time impulses* to a new movement in literature called Naturalism came to Germany from Scandinavia, France, and Russia through Ibsen, Zola and Tolstoy

Naturalism and the New Drama

Naturalism emphasized the minute description of environment and the portrayal of the ugly rather than the beautiful An association *die freie Bühne* (the free stage), was formed by a group of *drama critics* to further the performance of the new type of plays Hauptmann's 'Vor Sonnenaufgang' (Before Sunrise) in 1889 marked a new era in German drama He wrote many other naturalistic plays and at a later period the symbolistic play 'The Sunken Bell Sudermann *won popular favor at home and abroad by* many novels and dramas He was a skillful playwright rather than a great dramatist Liliencron an army officer put into poetry the everyday experiences of his own life in new and changing meters

Naturalism with its emphasis upon outward conditions and upon the sordid and ugly could not long satisfy the German mind Thus almost concurrently with Naturalism came the movement known as Im*pressionism It implied an emphasis upon the ich* (that is the "I"), the personal the soul, but with keener analysis than in Romanticism The novelists Gustav Frenssen Clara Viebig and Helene Bohlau described their native towns and districts in a naturalistic way Their impressionistic touches distinguished their stories from the older type of village tale Schnitzler wrote sophisticated comedies for the stage

The Literature of Social Problems

The so-called new Romantic movement was also opposed to Naturalism Hugo von Hofmannsthal wrote lyrical dramatic pieces full of musical charm, and Ricarda Huch wrote important critical works and developed further the historical novel Classical tendencies also appeared Rainer Maria Rilke wrote mystical poems that lost little of their beauty in English translation The aristocratic Stefan George emphasized form in his lyrics Richard Dehmel sought a harmony of spirit and of form in his lyrics The theme of his poetry was the individual in his relation to society Thomas Mann Heinrich Mann and later Erich Maria Remarque in their novels sought a solution of the same social problems

These tendencies to consider the good of society as a whole as against the individualism of Nietzsche s philosophy grew stronger from the period of the 1890's on Philosophers thought of the individual in his relation to the universal and the absolute A new attitude to religion grew up, especially after the first World War In the schools the Youth Movement *rose* This changing attitude in philosophy and religion is reflected in literature after about 1910 In literature the movement is called Expressionism The

Expressionists sought a new style and technique in the drama and new forms in lyric poetry. In the field of philosophy, Oswald Spengler attained fame and influence overnight with his 'Decline of the West'. In it he traced the life and death of great civilizations. Many dramas of Ernst Toller were based on the first World War. To the 20th-century poet God and soul were realities, and he expressed these realities in terms not merely of personal experience, but in terms of the typical and the universal. The reflective poet Franz Werfel and the mystical poet Rainer Maria Rilke were outstanding names in the poetry of that period. Fritz von Unruh, in his lyrics and dramas, found the meaning of human existence in love and brotherhood. (For Reference-Outline and Bibliography, *see* Language and Literature.)

Chief Figures in German Literature

Ulfilas (311?–383?)—Translation of Bible into Gothic.

Walther von der Vogelweide (1165?–1230?), minnesinger; national poet of Middle Ages.

Wolfram von Eschenbach (1170–1220), poet of knighthood—'Parzifal'; 'Titurel'.

Martin Luther (1483–1546)—Translation of the Bible; hymns.

Hans Sachs (1494–1576), mastersinger and dramatist—'Fastnachtsspiele' (Shrovetide Plays).

Friedrich Gottlieb Klopstock (1724–1803), classical poet—'Der Messias' (The Messiah); odes.

Gotthold Ephraim Lessing (1729–1781), critic and dramatist—'Emilia Galotti'; 'Minna von Barnhelm'; 'Laokoön'.

Christoph Martin Wieland (1733–1813), novelist and poet—'Der goldene Spiegel' (The Golden Mirror); 'Agathon'.

Johann Gottfried von Herder (1744–1803), critic—'Kritische Wälder' (Critical Forests); 'Ideen zur Philosophie der Geschichte' (The Philosophy of History).

Johann Wolfgang Goethe (1749–1832), poet, critic, dramatist, and novelist—'Die Leiden des jungen Werthers' (The Sorrows of Young Werther); 'Wilhelm Meister'; 'Faust'; 'Hermann und Dorothea'.

Johann Christoph Friedrich Schiller (1759–1805), poet and dramatist—'Das Lied von der Glocke' (The Song of the Bell); 'Wallenstein'; 'Maria Stuart'; 'Die Jungfrau von Orleans' (The Maid of Orleans); 'Wilhelm Tell'.

Johann Paul Friedrich Richter ("Jean Paul") (1763–1825), humorous novelist—'Quintus Fixlein'; 'Siebenkäs'; 'Flegeljahre' (Wild Oats).

Friedrich de la Motte Fouqué (1777–1843), poet and novelist—'Undine'; 'Theodolf, the Icelander'.

Heinrich von Kleist (1777–1811), dramatist and poet—'Penthesilea'; 'Der zerbrochene Krug' (The Broken Pitcher).

Jakob (1785–1863) and Wilhelm (1786–1859) Grimm—*Fairy Tales.*

Arthur Schopenhauer (1788–1860), philosopher—'Die Welt als Wille und Vorstellung' (The World as Will and Idea).

Franz Grillparzer (1791–1872), Austrian dramatist—'Sappho'; 'Das goldene Vliess' (The Golden Fleece).

Heinrich Heine (1797–1856), poet—'Die Lorelei' and many other poems; 'Reisebilder' (Travel Pictures).

Willibald Alexis (G. W. H. Haring) (1798–1871), novelist—'Der falsche Waldemar'; 'Roland von Berlin'.

August Heinrich Hoffmann ("Hoffmann von Fallersleben") (1798–1874), poet and song writer—'Deutschland, Deutschland über alles'.

Fritz Reuter (1810–1874), novelist—'Ut mine Stromtid' (From My Peasant Days).

Berthold Auerbach (1812–1882), novelist—'Schwarzwälder Dorfgeschichten' (Black Forest Village Stories).

Friedrich Hebbel (1813–1863), poet and dramatist—'Judith'; 'Herodes und Marianne'; 'Agnes Bernauer'.

Otto Ludwig (1813–1865), dramatist and novelist—'Der Erbförster' (The Hereditary Forester); 'Zwischen Himmel und Erde' (Between Heaven and Earth).

Richard Wagner (1813–1883), writer of operas—'Lohengrin'; 'Tannhäuser'; 'Der Ring des Nibelungen'; 'Tristan und Isolde'; 'Die Meistersinger'; 'Parsifal'.

Gustav Freytag (1816–1895), novelist and dramatist—'Die Journalisten' (The Journalists); 'Soll und Haben' (Debit and Credit).

Theodor Storm (1817–1888), poet, novelist, and short story writer—'Immensee'.

Gottfried Keller (1819–1890), poet, novelist, and short story writer—'Der grüne Heinrich' (Green Henry); 'Die Leute von Seldwyla' (Seldwyla Folk).

Theodor Fontane (1819–1898), poet and novelist—lyric poems and ballads; 'Effi Briest'.

Conrad Ferdinand Meyer (1825–1898), Swiss poet and novelist—'Jürg Jenatsch'; 'Der Heilige' (The Saint).

Paul Heyse (1830–1914), poet, dramatist, novelist, and short story writer—'L'Arrabbiata'; 'Kinder der Welt' (*Children of the World*); 'Im Paradiese' (In Paradise).

Wilhelm Raabe (1831–1910), novelist—'Cristoph Pechlin'; 'Horacker'.

Friedrich Nietzsche (1844–1900), philosopher and essayist—'Jenseits von Gut und Böse' (Beyond Good and Evil); 'Also sprach Zarathustra' (So Spake Zarathustra).

Detlev von Liliencron (1844–1909), poet—lyric poems.

Ernst von Wildenbruch (1845–1909), poet, dramatist, short story writer—'Die Karolinger' (The Carolingians); 'Quitzows'; *lyrics, ballads, short stories.*

Karl Spitteler (1845–1924), Swiss epic poet and novelist—'Der olympische Frühling' (The Spring of Olympus).

Hermann Sudermann (1857–1928), dramatist and novelist—'Es lebe das Leben' (The Joy of Living); 'Heimat' (translated as Magda); 'Frau Sorge' (Dame Care); 'Die Ehre' (Honor).

Clara Viebig (1860–), novelist—'Das tägliche Brod' (Daily Bread); 'Das schlafende Heer' (The Sleeping Army).

Gerhart Hauptmann (1862–1946), dramatist—'Die Weber' (The Weavers); 'Die versunkene Glocke' (The Sunken Bell); 'Hannele'.

Arthur Schnitzler (1862–1931), Austrian dramatist and novelist—'Anatol'; 'None but the Brave'; 'The Lonely Way'.

Gustav Frenssen (1863–1945), novelist—'Jörn Uhl'.

Richard Dehmel (1863–1920), poet and dramatist—'Michel Michael'; lyric poems.

Frank Wedekind (1864–1918), dramatist—'Frühlings Erwachen' (The Awakening of Spring).

Ricarda Huch (1864–1947), novelist and poet—'Defeat'; 'Victory'; 'The Deruga Trial'.

Stefan George (1868–1933), poet—'Das Jahr der Seele' (The Year of the Soul); 'Die Lieder von Traum und Tod' (Songs of Dreams and Death).

Heinrich Mann (1871–1950), Novelist—'Die Armen' (The Poor); 'Mutter Marie' (Mother Mary).

Jakob Wassermann (1873–1934), novelist—'The World's Illusion'; 'Caspar Hauser'; 'The Maurizius Case'.

Hugo von Hofmannsthal (1874–1929), Austrian dramatist—'Elektra'.

Thomas Mann (1875–), novelist—'Die Buddenbrooks'; 'Der Zauberberg' (The Magic Mountain); 'Der Tod in Venedig' (Death in Venice).

Rainer Maria Rilke (1875–1926), poet—lyric poems.

Hermann Hesse (1877–), novelist and poet—'Peter Camenzind'; 'Siddhartha'; 'Narziss und Goldmund' (Death and the Lover); 'Das Glasperlenspiel' (Magister Ludi).

Oswald Spengler (1880–1936), philosopher—'Der Untergang des Abendlandes' (The Decline of the West).

Fritz von Unruh (1885–); dramatist, poet, and novelist—'Ein Geschlecht' (Of One Race); 'Heinrich aus Andernach'; 'Opfergang' (The Way of Sacrifice).

Arnold Zweig (1887–). novelist—'The Case of Sergeant Grischa'.

Paul Kornfeld (1889–1942), dramatist—'The Seduction'.

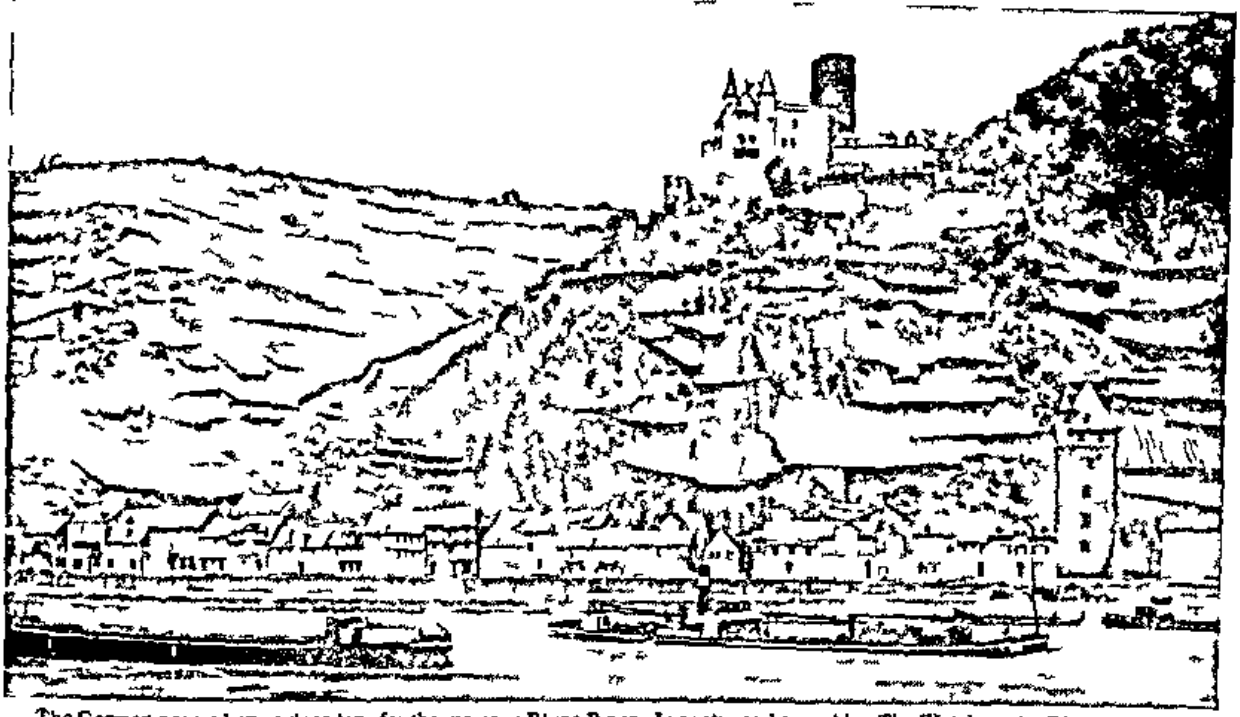
Walter Hasenclever (1890–1940), dramatist—'Beyond'; 'The Son'.

Franz Werfel (1890–1945), Austrian novelist, poet and dramatist—'Einander' (One Another); 'Der Spiegelmensch' (Reflected Humanity); 'Class Reunion'; 'The Pure in Heart'; 'The Forty Days of Musa Dagh'.

Ernst Toller (1893–1939), poet, dramatist—'Massermensch' (Man and the Masses); 'Die Machinenstürmer' (The Machine Wreckers); 'Die Wandlung' (Transition).

Erich Maria Remarque (1898–), novelist—'All Quiet on the Western Front'; 'The Road Back'.

The GERMAN PEOPLE and Their LAND



The German peop e have a deep love for the ma es c Rhine R ver In poetry and song like The Watch on the Rhine t sym bolizes their patr otism their strength and their history Here terraced vineyards rise to a cast e gua ding the steep bank.

GERMANY The homeland of the German people is in the heart of Europe It s a rugged land of w de pla ns and forested h ghlands that reach up nto the Alps in the south For centur es t was split nto k ngdoms states duchies and free cit es Then n 1871—nearly 100 years after the b rth of the United States—these many un ts jo ned together to form the German Emp re

The Germans were devoted to the r homeland They called it *Das Vaterland* the Fatherland and *Deutsches Reich* German realm Pat ent hard work ng and thorough they developed t nto the strongest nat on on the continent of Europe

But twice in the 20th century w thin a s ngle gener at on Germany m sused its po er to launch a world war Both t mes it suf fered defeat Today as a result of the second World War it is spl t into two separate countr es

The larger s the Feder al Republ c of Germany o West Germany It is a democracy sponsored by the free nat ons The area of West Germany is 95 867 square m les vith a popu lat on of 49 728 963 It is largely industrial

The second nat on is the German Democrat c Republ c or East Germany It is a Commun st state controlled by Russia The area of East Germany s only 41 535 square miles Its popu lat on s only 18 488 316 It s ch efly agr cultural

Though Germany s now spl t polit cally the land must be seen as a whole to un lerstand how the people bu lt Germany into a m ghty country and to under stand the r problems today

Location and Size of the Land

Germany is a Central European land It lies in about the same lat tude as Ontar o Except where it opens north to the Balt c Sea and the North Sea it is land ocked It has more ne ghbors than any other European land and almost no natural front ers

Just before the outbreak of the second World War Germany covered 181 630 square m les Greater Ger many wh ch ncluded the se zed terr tor es of Austria and the Sudeten land stretched over 225 199 square m les

The war stripped Ger many of its conquests and some of ts own terr tory—chiefly S les a and East Pruss a Today sh runken Germany extends about 500 m les from north to south and 250 to 500 m les from east to west Its total area s only 137 40? square m les—the com b ned areas of West

Es en North to sou b about 500 m es east to wes 250 to 500 m es West Germany a ea, 95 867 square miles popula on 1950 census 49 732 874 Eas Ge many area 4 535 square miles population (1946 census 18 517 567

Nat al Feat u es. Northe n plain central uplands sou hern mountains Ch ef ve s Danube Rhine Mose e Ne ka Ma n Ruhr, tr butar es Ems Wese Ode E be Saa e tr butary Ch ef mountains Bavarian Alps Bohemian Fo est, Er gebirge Black Fo est Thuringian Fo es Taunus and Harz Mountains

P odu s Iron and steel manufa tu es text es chem ca s e e tri ca goods pottery wine beer potatoes whea tobac o sugar beets rye oa s bar ey, timbe hogs catt e da y produc s be ring and other fish coal gra e salt and potash

Ch ef C es—Be lin West 1950 census East 1948 est 3 350 785 *West Ge man cities* 1950 census Hamburg 1 605 606 Munich, Essen ove 600 000 Co ogne F ankfurt-on the Main Dortmund Dusseldo f (ove 500,000 Stuttgart B emen Hanove Duisbu g *Wupperta* Nuremberg Ge senkirchen ove 300,000 East Ger man cities (1946 census Leipzig 607 658 D esden 467 966

Histo c D v s ons (in o de of area Prussia abo ished by Allies 1947 Bavaria Wurttembe g Mecklenburg Baden Saxony Thu ingia Hesse, O denburg, Brunsw k Anha t Saarland Lippe Hamburg Schaumburg L ppe and B emen



The light parts of this map show Germany at its greatest extent in 1939, just before it began the second World War. At that time East Prussia, Pomerania, and Silesia were part of it, and it had annexed Austria and dominated Czechoslovakia. The shaded lines show the southern and eastern boundaries of shrunken Germany today. The map of the Greater Ruhr Basin (inset) shows in detail the crowded cities, rivers, and canals that make this part of the lower Rhine River the industrial heart of Germany.

Germany and East Germany This area makes Germany the fourth largest country of Europe but smaller than the single American state of Montana

Nature of the Land

Two natural regions divide Germany almost in half Northern Germany is part of the Great European plain and is mostly flat and low Southern Germany is a rugged mass of highlands which rise into plateaus and mountains and dip in rich valleys The southern edge of the plain winds from Aachen on the Belgian border eastward through Dusseldorf Hanover and Leipzig to Gorlitz on the Neisse River From that approximate line the plain gradually drops to the Baltic and North seas The coast line is so regular that it provides few good harbors except where rivers have carved navigable channels for large ships

Four great rivers flow northwest across the plain linking the southern highlands with the seas The Oder River in the east empties into the Baltic The Elbe and the Weser flow into the North Sea (*see* Elbe River) The mouth of the mighty Rhine in the west is outside Germany in the Netherlands (*see* Rhine River) These rivers carry barges and small steamers far into the heart of Germany Through the rugged highlands of southern Germany the upper Danube flows eastward leading into Austria and the countries of southeastern Europe (*see* Danube River)

The plain is the work of the Ice Age (*see* Ice Age) The giant ponderously moving ice sheets scoured north Germany into flat land except for moraines along their edges—ridges of boulders gravel and sand In the plain s northeast one ridge forms the Baltic Lakes Plateau or Baltic Heights *Dotted by* lakes it rises from about 300 feet to 1 000 feet On the flat coast below it a fertile strip of lowland reaches *inland from 10 to 20 miles To the southwest* between the Elbe and the Weser another ridge forms the Luneburg Heath or Luneburger Heide

Land Bays and Valleys

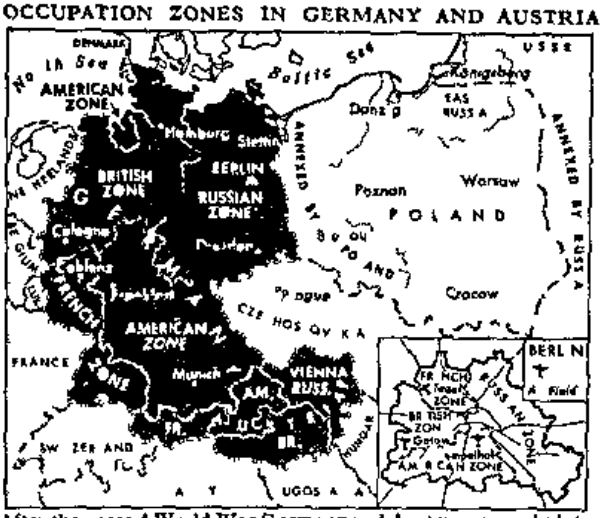
The plain reaches southward into the highlands forming three great land *bays among the rugged* heights These bays are the basins of the Oder the Elbe and the Rhine

As the ice melted along the edges of the plain the flood waters cut some valleys in an east-west direction The Germans *used them as routes for* canals and railways to link with the northward flowing rivers Between the valleys lie sandy stretches

Highlands Mountains

The last glaciers of the Ice Age did not reach into central Germany Beautiful hills and knots of forested

OCCUPATION ZONES IN GERMANY AND AUSTRIA



After the second World War Germany and Austria were split into occupied zones by the United States Britain France and Russia They jointly administered Berlin (inset) Poland took part of East Germany and divided East Prussia with Russia

mountains *jut above high plateaus* cut by deep river valleys The mountains are low with rounded summits The Harz Mountains rise abruptly from the *plain But their peak the Brocken of folklore rises* to only 3 747 feet (*see* Harz Mountains) To the southeast stand the Erzgebirge or Ore Mountains named for their wealth of ore *Erz* and *Gebirge* mountains Other central Germany ranges include the Fichtel Thuringer Wald *Bohmer Wald and the Rothaar* Southern German mountains are higher The Black Forest mountains or *Schwarzwald* help to shelter the *upper* Rhine Valley (*see* Black Forest) Like several German ranges it is so heavily wooded it is called a forest *Wald* instead of 'mountains

The great Alps reach into southernmost Germany in Bavaria (*see* Alps) There about 50 miles southwest of *Munich rises the Zugspitze* This peak towers 9 719 feet and is the highest point in Germany

Lakes of Germany

Germany s largest lake is beautiful Lake Constance or *Bodensee* on the Swiss-Austrian border It is about 40 miles long Only the north and west shores are German

The hills and mountains of southern Germany cup many *picturesque lakes such as* Chiem See in the Bavarian Alps Central Germany has few lakes But hundreds of small shallow lakes linked by rambling rivers *form a net*work in the Baltic region of the northern German plain

Climate Nearly Uniform

The German people enjoy a temperate climate, with *mild*

POLITICAL DIVISIONS OF GERMANY

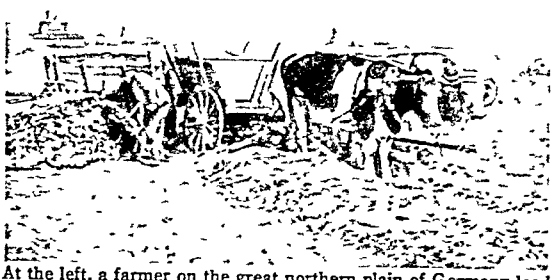
West Germany (Federal German Republic) is divided into 10 states or Länder

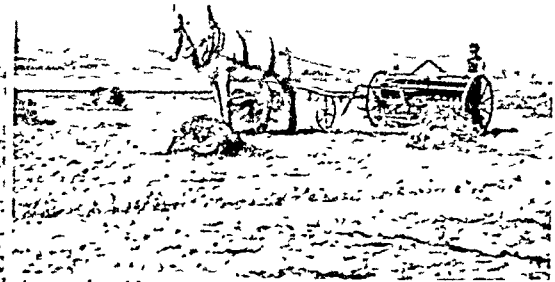
- Bavaria (*Bayern*)
- Berlin West
- Bremen
- Hamburg
- Hessen
- Lower Saxony (*Niedersachsen*)
- North Rhine Westphalia (*Nordrhein-Westfalen*)
- Rhineland Palatinate (*Rheinland-Pfalz*)
- Schleswig Holstein
- Württemberg-Baden

East Germany (German Democratic Republic) in 1952 divided *5 states—Brandenburg* Mecklenburg Saxony Saxony Anhalt and Thuringia—into 14 districts *East* Berlin was not changed

- Frankfurt Cottbus Potsdam (from Brandenburg)
- Rostock Schwerin Neubrandenburg (from Mecklenburg)
- Leipzig Dresden Chemnitz (from Saxony)
- Madgeburg *Halle* (*from Saxony-Anhalt*)
- Erfurt Gera Suhl (from Thuringia)

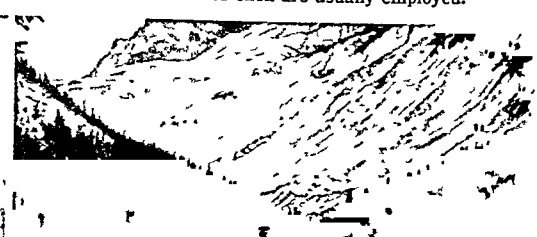
FROM NORTH TO SOUTH IN GERMANY





At the left, a farmer on the great northern plain of Germany loads turnips into his oxcart. About half of Germany lies on the plain. At the right rise the gentle hills of central Germany. This farmer works his small fields near Frankfort-on-the-Main. Some German farmers use agricultural machines, but most farms are so small that horse and oxen are usually employed.







Southern Germany is a tangled mass of mountains and gorgelike valleys. At the left, husband and wife cut logs in the Bavarian Alps. They will float them to a sawmill. Small-scale logging like this is one of the chief industries of upland Germans. The beauty of Bavaria, as shown by the snow-covered village at the right, makes it a resort center in both winter and summer.

winters and summers. It varies little from north to south, because flat northern Germany is open to the tempering sea winds, while the altitude of the highlands keeps southern Germany cool. The warmest part of southern Germany is the sheltered valley of the Rhine and of its tributaries—the Moselle, Neckar, and Main rivers. The coldest is mountainous Bavaria.

A wider difference in climate occurs from west to east. The prevailing westerlies give western Germany almost a marine climate. Eastward the climate becomes more continental, with a wider range between summer and winter temperatures.

Rainfall is usually enough for all types of agriculture. The heaviest fall is in summer, with the peak usually in July. Most parts of the land get from 20 to 30 inches a year.

In the north the greatest fall is in the Harz Mountains, the first range standing in the path of the

FARMING PEOPLE AND THE LAND'S VARIED CROPS



This Bavarian family is saying grace before supper The men and boys have spent the day pastu ing their cows in A pine meadows Dairying is an important industry in southern Bavaria.



Vineyards flourish on sunny slopes in the Rhine Valley These men are gathering grapes for the winer es The grapes will be crushed fermen ed and aged to produce white table wines



On the northern plain women work with men to gather potatoes that have been scooped out of the ground *by a harvester* Potatoes form a large part of the German people s diet.



These young Bavarians are cutting hay on a moun ain slope with sure swings of their scythes They will load the hay into baskets and carry it down into the valley to feed their stock.

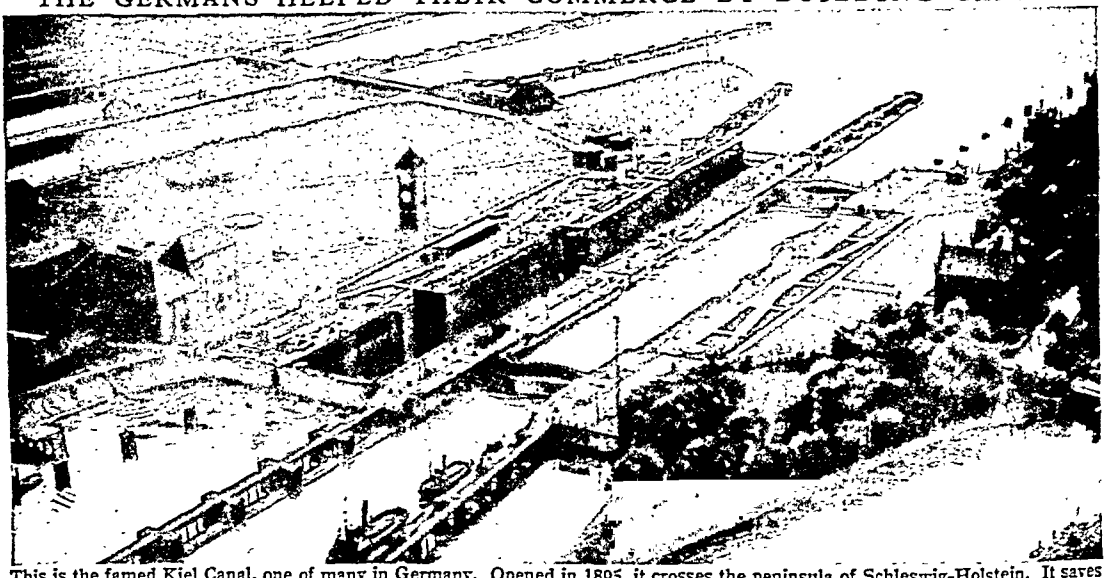
moist sea winds from the northwe t From 30 to 40 inches drench the Harz In southern Germany craggy Bavaria gets up to 55 inches of precip *tat on* while the sunny Rhine Valley gets only from 16 to 20 inches

The People Their Language and Customs

Germans come of mixed stock *Northern* Germans are usually tall fair haired and *blue-eyed* They re semble the *yellow haired* Teutonic warriors described by Caesar . South and central Germans tend to be shorter heavier and darker From their earliest days the Germans have seemed to depend heavily on firm leadership But individually they are hard working thrifty methodical and painstaking

German schools teach High German the speech that comes from the highlands of southern and central Ger many These were the German regions first touched by c vilizat on and Chr stianity as they were colonized by the Romans They long led the rest of Germany in

THE GERMANS HELPED THEIR COMMERCE BY BUILDING CANALS



This is the famed Kiel Canal, one of many in Germany. Opened in 1895, it crosses the peninsula of Schleswig-Holstein. It saves a voyage of about 250 miles around Denmark, and so helped Hamburg to rival Copenhagen as a gate to the Baltic Sea.

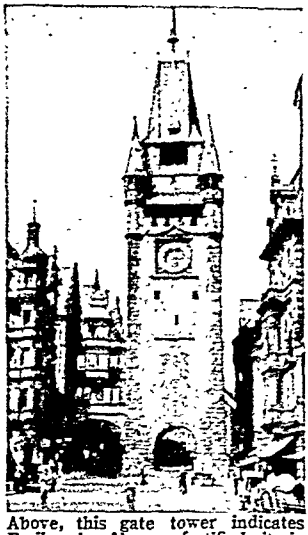
education and the arts. In north Germany many speak Low German, which is accented differently and is more guttural. Both languages have several dialects.

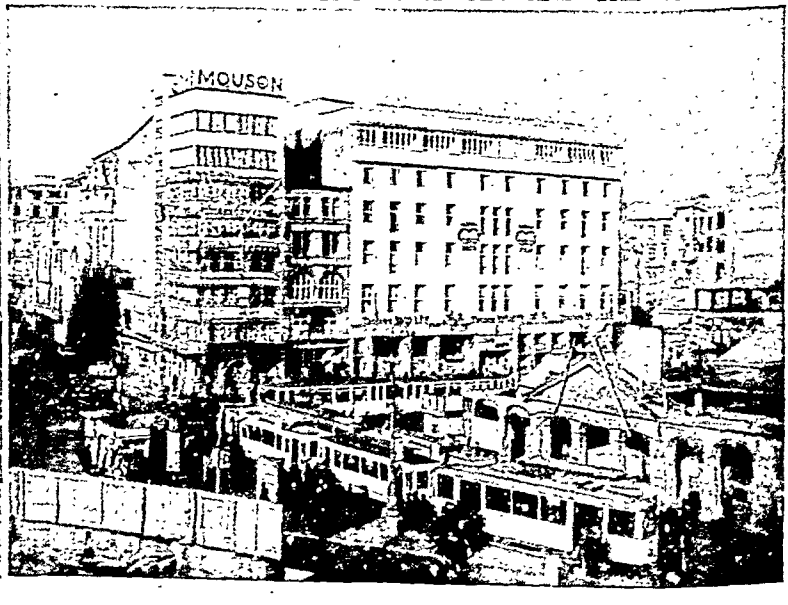
Customs vary in different regions, but Germans are noted for their love of music, dancing, and the out-of-doors. Mountain villages preserve many of the old ways of dress and life. But over half the people live in cities or towns. It has been said that "city Germans take their recreation seriously," because they seem to plan their outings meticulously. They especially like to cycle, hike, camp, and boat—threading the many rivers in collapsible canvas canoes, or *Faltboten*. Camp sites and inexpensive hostels dot the land.

Germans Improve Their Agriculture

Though less than half the Germans farm, agriculture is the chief industry. Western Germany farms are small, from about 50 to 100 acres. The large Prussian estates in eastern Germany have been split among the former workers. Except for the land bays, most of the northern plain is naturally rather poor. But late in the 19th century German scientists developed fertilizers from the potash of Silesia and began an

GERMAN CITIES BLEND THE VERY OLD AND THE VERY NEW





Above, this gate tower indicates Freiburg's rôle as a fortified city in early German wars. Right, heavily bombed Frankfort-on-the-Main raises modern buildings amid the wreckage of the second World War.

GERMANY S MANUFACTURES RANGE FROM MACHINERY TO TOYS



Above is a view of an aisle at the annual trade fair in Co ogne This expos tion building rep aces one bombed in the second World War Through trade fairs German manufacturers solic t world wide orders Upper right a methodical craftsman makes washable unb eakable dolls lifelike Hundreds are sent weekly all over the world Lower right a techni ian carefully assemb es glass apparatus for use in laboratory research.

intensive system of crop rotation to feed and rest the soil The plain is now the chief source of rye and potatoes the principal foods of the Germans Quantities of sugar beets and some wheat grow in the southern part of the plain The Rhineland vineyards produce world famous dry wines and Bavaria grows hops for beer the nat onal drink The German cl mate is so cool farmers can grow very little corn

Nearly every region grows hay Stock raising and dairying are on the increase Almost every farm ra ses hogs and sausage and other pork products are noted German dishes Truck gardens in the industrial areas help to supply city workers with vegetables F sh er es add to the food supply with large catches of herring mackerel codfish haddock and other fish

But from the time Germany began to industrialize in the 1870 s it has not been able to produce enough to feed itself So many workers are in industry that Germany must import agricultural products and pay for them with manufactured goods

Scientific Forestry Conserves Timber

In barbarian times Germany was largely covered by forest Today forests cover about a quarter of the land During the empire government control enabled Germans to pioneer in sc ent fic forestry No one was allowed to cut a tree even in a private forest with out planting another Thinning the trees and remov ing underbru h let the timber grow tall and mastlike for lumber and pulp During the second World War German scientists made *ersatz* or subst tute products from wood pulp Because evergreens grow relatively fast they are largely now planted for forest but cities continue to grow the favorite lindens

Manufacturing Aided by Minerals

Germany was late to feel the Industrial Revolution (*see* Industrial Revolution) But when its people did turn to manufacturing in the 1870 s their traits and natural resources soon moved them into the industrial leadersh p of the continent

Like other industrial countr es Germany based its manufactures on a good supply of coal The Ruhr basin gave it Europe s largest beds of coking coal More lay in Silesia and the Germans won still more in the Saar basin of Alsace-Lorraine There they had iron-ore deposits and some petroleum (*see* Alsace-Lorraine) They also had vast beds of lignite This brown coal was too poor for coking but it fueled electric power and aided dye making and the chemical manufactures based on potash from Silesia Until just after the first World War Germany had a world monopoly on the manufacture of aniline dyes (*see* Dyes) The country was also rich in vast deposits of salt

The Ruhr basin became an almost cont nuous string of great industrial cit es Like the American cities of Gary Ind and Pittsburgh Pa they turned out iron and steel products At Essen the giant Krupp works sprang up (*see* Essen) Other cities made textiles chemicals electrical goods leather products toys and pottery In east central Germany Leipzig spe-

GERMANS DELIGHT IN THEIR OUTDOOR CAFÉS



Even though it is cool enough for topcoats, these Berliners sit at sidewalk tables to enjoy coffee and conversation. Every large German city has a number of coffee-houses as well as outdoor beer gardens.

cialized in printing, and Jena in optical goods, microscopes, and camera lenses (*see* Leipzig).

Munich and Dresden became world-known as centers of culture, education, and technology, but they also added to Germany's manufactures. Nuremberg's craftsmen gained fame as toymakers. Both Aachen and Cologne grew to be giant rail centers and produced heavy industrial goods. The vast city of Berlin housed almost every sort of manufacture. (*See also* Aachen; Berlin; Cologne; Dresden; Munich; Nuremberg.)

Cheap water transportation also aided German industry. A low-level network of canals links the principal navigable rivers. The Mittelland Kanal (Midland Canal) joins the Ems, Weser, Elbe, and Oder rivers. In the north the Kiel Canal cuts across Schleswig-Holstein. Heavy freight in the Ruhr is shipped through the Lippe and Rhine-Herne canals. Canalizing the Main River made the Rhine-Danube Canal possible.

Builds Great Foreign Trade

Germany not only became the manufacturing center of the continent, but it also built a huge foreign commerce. This was partly the reward of the methodical approach of the Germans. They studied the tastes as well as the needs of foreign customers, then produced articles to suit. German commercial agents learned the languages of their customers. At the outbreak of the first World War the volume of German commerce was second only to that of the United States. Much of the commerce that was lost during the war was recovered soon after, especially in South America.

Shipping became one of Germany's chief industries. Hamburg on the Elbe River, 75 miles inland from the North Sea, grew to be Europe's largest seaport. Its shipyards turned out all types of vessels for ocean and river trade (*see* Hamburg). Lubeck, Rostock, and other Baltic seaports, famed in the days of the Hanseatic League, lost most of their old importance when vessels became too large for their shallow harbors.

AFTER SCHOOLROOM LESSONS—AN OUTING



At left is a classroom in one of the new schools built in West Germany since the end of the second World War. Boys and girls sit informally at their work tables. On the blackboard is a drawing of "Our Heart" (Unser Herz) American educators supervised the postwar textbooks. At right, a young hiker, rucksack on back, is greeted by the director of a youth hostel.

Most of these c t es were such keys to German might that they were severely bombed in the second World War Aachen Cologne Hamburg and Berlin were virtually razed It has been estimated that rebuild ng these c ties to their full extent will require from 25 to 40 years Contractors are trying to speed the work by processing the rubble into build ng stone People in all the bombed c t es are mak ng efforts to restore their family gardens where they enjoy the rest and beauty of the outdoors after work The victorious po ers are returning art treasures to German museums

Education under Empire and Hitler

During the empire and H tler s Third Reich German schools emphasized ruthless nat onal sm and technology Germany won renown during the empire for the thorough ness of its univers ty train ng in research and experimentation Students came from abroad to be trained in science Many also came to study the r gid theor es of art and philosophy that compr sed the German ver sion of culture *Kultur* which stressed d sci plined thought It also inculcated the idea that Germans formed a super race At the Un vers ty of Heidelberg saber duel scars were honored as the mark of a gentleman

Both the emp re and H tler s Third Reich turned education to serve the nationalistic drive of the state Teachers stressed the dest ny of the German *race* much as teach ers in Japan propagandized their pupils Even sports were organ zed into demonstra tions of national pr de Fore gn winners at the Olympic Games in Berlin in 1936 were received with coolness

Under the emp re Germany wisely prov ded ele mentary education for all boys and girls But it fa vored those of noble b rth or wealth These went on to class cal or mixed course schools then univers ties The boys served but one year in compulsory mil tary training They got the better jobs as officials sc en tists executives or m litary officers Those of poorer means went on to trade or voca t onal schools or in some instances tech n cal colleges The Nazi Third Re ch followed this plan to a large extent and even bol stered it with nationalistic youth organi zat ons

Education Becomes a Problem

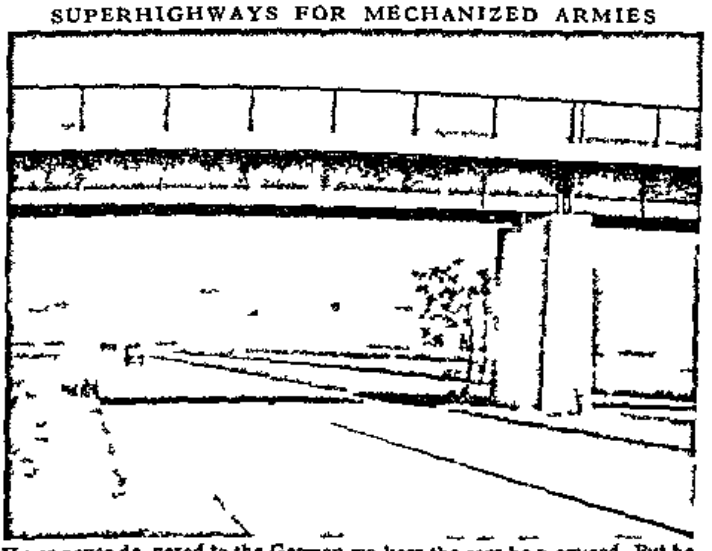
After the Re ch s defeat in the second World War the victorious western All es set out to de-Naz fy German teachers and l ngoistic textbooks They found the task d fficult The problem was doubly hard in West Germany s 16 univers ties for the college students had spent all their earl er school days under the Nazi system of regi mentation And wh le the democrac es worked to have the West German schools try to teach the principles of democrat c self government East German schools stressed Communism (For govern ment *see* the following history section)

A FAMOUS CASTLE IN THE BAVARIAN ALPS



Symbolic of the days when a mult tude of more or less independent princes ru ed Germany is this cast e of Neuschwanstein Bu t in 1869 by Ludwig II of Bavaria it follows in its general des gn the type of cast e common in the mountain distr cts of Germany in the M dd e Ages

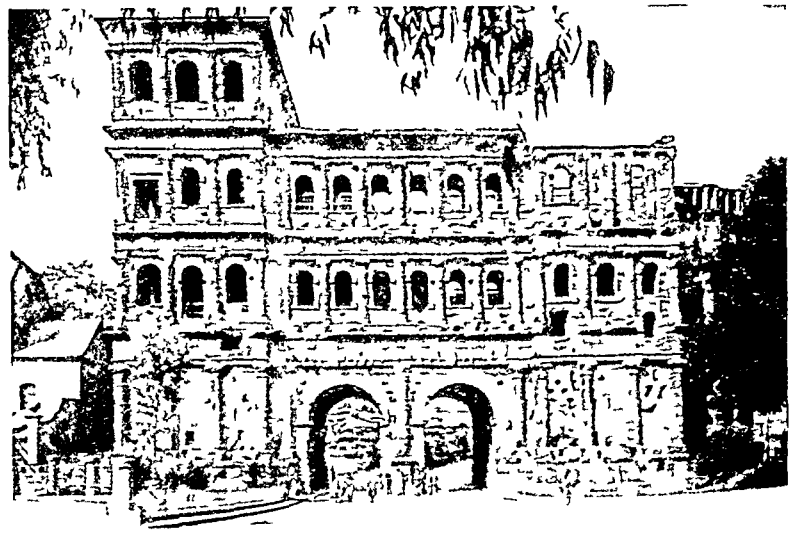
SUPERHIGHWAYS FOR MECHANIZED ARMIES



Hit er never de vered to the German wo kers the cars he p omised But he kept thousands busy building a network of superh ghways Over them his mechanized armies rolled out of Germany to try to conquer a continent

Two Thousand Years of German History

AS LONG as 2,000 years ago Germans were living in the lands west of the Rhine River Their ancestors may have migrated there from the grasslands of southern Russia They pushed back the stalwart Celts The Germans, when the Romans first battled them in 113 B C , were warlike barbarians The men hunted while the women worked the fields, yet the men respected the women The German barbarians fought the northward march of the Roman Empire. But the empire built colonies, such as Trier and Cologne, up to the middle Rhine, then penned the Germans behind fortifications called *Limes Germanicus*



Centuries of war have spared this Roman gate at Trier. It is a relic of Roman colonies in Germany. The Romans brought civilization into central Germany.

Meanwhile the Germans organized into barbarian groups, such as the Franks, Goths, Saxons, and Vandals. In the 3d and 4th centuries of the Christian Era they wrested lands from the weakened Roman Empire (*see* Middle Ages). But in the 8th and 9th centuries most of these barbarian conquests were absorbed into the kingdom of the Franks, which reached its height under Charlemagne (*see* Charlemagne). The south Germans had already been converted to Christianity by Irish monks and by St Boniface (*see* Boniface, Clovis). Charlemagne forced the north Germans to become Christians. His realm extended north to the Baltic, south to Spain and Italy, but only to the Elbe in the east where the Slavs lived The split of the Franks' empire in the Partition of Verdun in 843 marked the beginning of Germany and France as separate states Between them lay a strip—Lorraine—which both sought for 1,000 years

Medieval German States

For several hundred years after 843 Germany was cut into "stem duchies." Each was the home of a separate stem or branch of the German people. The chief duchies were Bavaria, Swabia, Franconia, and Saxony. The Franconian dukes were the first to become German kings after the end of Charlemagne's line in 911. Then Saxon dukes became kings The strongest was Otto I, the Great, who reigned 936–973 He revived Charlemagne's realm, except for France. But the new empire drained Germany's power for centuries as successive emperors sought to enforce their claims, especially over Italian cities, and quarreled with the popes (*see* Holy Roman Empire).

BY SWORD AND BY CROSS



Two warriors steady the war charger of Charlemagne, greatest leader of the Teutonic tribes As king of the Franks, he forced most Germans to become Christians

In 1024 the Franconian (or Salian) house was elected to rule. The empire became torn by the Investiture Conflict between Henry IV and Pope Gregory VII and their successors (*see* Gregory, Popes, Henry, Kings of France) From 1138 to 1254 the Hohenstaufens ruled. The chief rulers of this line were Frederick I, called Barbarossa or "Red Beard," and Frederick II.

But the drain of wars and the spread of feudalism weakened the sprawling empire The land-division system of feudalism split the stem duchies into a thousand little powers (*see* Feudalism) Even cities assumed local power. Some, like Hamburg, became "free cities" Many formed themselves into powerful commercial groups, such as the Hanseatic League

(*see* Hanseatic League) With the breakdown of the emperor s power Germans developed intense loyalty to their towns and local regions

The decline of the emp re resulted in the Great Interregnum 1254 1273 when the electors could not agree on an emperor Germany was in chaos Robber barons arose everywhere and ruled from their hilltop castles and river forts by *Faustrecht* (fist law) Then Pope Gregory X forced the electors to name Rudolph of Hapsburg emperor *see* Hapsburg In 1356 Charles IV issued the Golden Bull fixing the right to elect the emperor in the Seven *Electors* —the archbishops of Mainz Cologne and Trier (Treves) the margrave of Brandenburg the elector of Saxony the count palatine of the Rh ne and the king of Bohemia He also confirmed the power of free cities

Religious Strife and Civil War

In the 16th century the emperor could not quell the Reformation the religious revolt started by Luther and aided by state rulers (*see* Reformation) The religious struggles of the Thirty Years War 1618-48 further weakened the emperor's power (*see* Thirty Years War) The heads of the several hundred states became absolute rulers and the Hapsburg emperor only a symbol

Rise of Prussia

In the latter part of the 18th century Frederick the Great of the Hohenzollern l ne took lands from Austria and Poland to enlarge his k ngdom of Prussia He made Prussia the best-ordered and strongest state in Germany (*see* Frederick the Great Prussia) He prepared the way for a united Germany At the same time an intellectual surge arose in Germany bring ng the great literary and philosoph cal works of such gifted men as Goethe Schiller Kant and Hegel (*see* German Language and Literature)

But the Napoleonic Wars devastated Germany The crushing defeat of the Prussians at Jena in 1806 led to the reorganization of Prussia Serfs were freed and Prussia started un versal military service

By 1814 the several hundred German states had been reduced to 39 including Austria The Congress of Vienna 1814-15 grouped these into a loose German Confederat on Its head was a diet or assembly made up of delegates appointed by the German rulers. Austria and Pruss a vied to control it In 1848 German liberals demanded in va n that Germany be unified and given a democrat c government

Bismarck Creates New German Empire

The actual creat on of a new German Empire was the work of Bismarck (*see* Bismarck) For years he was the Prussian delegate to the d et His experiences convinced him that German unity could be ach eve l only through blood and iron by Pruss a defeating Austria on the field of battle

In 1866 he maneuvered Austria into war and crushed it at Sadowa (Koniggratz) Prussia then re-organized Germany and excluded Austria Ruthlessly Prussia annexed the states of Hanover Hesse-Cassel Nassau and the free city of Frankfort-on the Main The other German states north of the Main R ver ined with Pruss a in a North German Confederation

PRUSSIANS STORM AUSTRIAN COMMAND POST



On Dec 5 1757, the superbly trained army of Frederick the Great routed the Austrians at Leuthen in Silesia in a key battle of the Seven Years War Here the Prussians race to se ze the embattled Leuthen Church

In 1870 Bismarck tri ked France into declaring war (*see* Franco-Prussian War) Defeated France had to cede Alsace Lorraine to Germany The south German states enthusiastically joined the Prussian organization

The German Empire was proclaimed on Jan 18 1871 in the French royal palace at Versailles The king of Prussia was proclaimed perpetual German emperor or kaiser There was a popularly elected legislature or Reichstag but the real power lay with the kaiser Bismarck was iron chancellor in the reigns of Emperor William I and Emperor Frederick III (*see* William German Emperors) *Bismarck led the empire to industrial power and* military might The foundations were laid for a colonial realm which grew to include about 1 000 000 square miles in Africa (*Togoland Cameroons German* Southwest Africa German East Africa) and 100 000 square miles in China and the Pacific (Kiaochow Bay in Shantung province Kaiser Wilhelm Land in New Guinea Bismarck Archipelago Caroline Islands)

Germans Bid for World Power

William II succeeded Frederick III in 1888 (*see* William German Emperors) In 1890 he rudely dismissed Bismarck as chancellor saying Only one is master in the Reich and it is myself He built Germany into a military nation and encouraged Germans to dream of a Pan German state in Europe of *Drang nach Osten* drive to the east and even of world domination. Alarmed Great Britain France and Russia joined in

WHEN VICTORY SEEMED SURE



Kaiser Wilhelm, "Most High War Lord," arrives in occupied Wilno in January 1918, after the collapse of Russia in the first World War. Barely nine months later he fled from defeated Germany.

a defensive pact called the Triple Entente in 1907. But Germany continued to prepare for war.

In 1914 Germany struck. It backed Austria against Russia and so launched the first World War (*see* World War, First). Defeat in 1918 stunned the Germans, for their homeland had suffered no damage. At the end of the war, the government collapsed. William II fled, and the rulers of all German states abdicated.

The Hapless Weimar Republic

The bewildered people elected a national assembly, dominated by Socialists. At Weimar it drew up a liberal constitution. But the people were not trained in democracy. They were used to leadership.

Revolts, some led by Communists, flared in large cities. Germans thought only military force could restore order. Demobilized young officers organized veterans into private armies and offered "protection" to wealthy landowners and industrialists. The weak government tacitly approved these lawless bands.

Unemployment and hunger mounted. The Treaty of Versailles had stripped Germany of some of its richest industrial areas (*see* World War, First, section "The Peace and Its Results"). Inflation soared until it took a billion marks to equal one prewar mark. The middle class was pauperized. The people needed a statesman to guide them, but tradition turned them to an old Prussian leader, Field Marshal von Hindenburg (*see* Hindenburg). In 1925 they elected him to succeed Friedrich Ebert as president of the republic.

Germany Prospers, Then Collapses

In 1924 the United States aided Germany with the Dawes plan for payment of reparations and followed this in 1929 with the even more generous Young plan. Americans quickly invested huge sums in Germany and the nation prospered. The merchant fleet which had been lost to the Allies was replaced with new, faster ships. Luxury ocean liners and Zeppelins brought in tourists. Copying American methods, Germany modernized its factories. Soon it regained its top place in chemical, optical, and electrical industries. In 1930 Germany again had sovereignty over its whole land when France withdrew its troops from the Rhine.

But this prosperity was not sound. Even the interest on Germany's huge loans was paid in foreign credit. When the New York stock market crashed in 1929 loans stopped. The Hoover moratorium in 1931 saved Germany from bankruptcy, but the weak Weimar government was shaken. In 1932 a strong fascist party opposed Hindenburg. This was the National German Social Workers' party (*Nationalsozialistische Deutsch Arbeiterpartei*, shortened to *Nazi*). Its leader was Adolf Hitler, war veteran and demagogue (*see* Hitler).

Hitler Strides to Power

In January 1933 the military clique (Junkers) persuaded the aging Hindenburg to appoint Hitler chancellor. This pleased the Germans, for Hitler had promised to make them rich and dominant again. In thundering oratory, he flattered them into believing they were a superior "master race." He hammered into them that their army "had not been defeated," that the war had been lost through trickery of Communists and Jews. He revived the old German ambitions.

FIRST PRESIDENT OF GERMANY



Friedrich Ebert, a Social Democrat, was elected in 1919. He strove to give Germany a democratic government. His effort was futile.

As chancellor, Hitler seized control of press and radio and called an election. A fire flared in the Reichstag. Many believed the Nazis set it. But Hitler declared it was a Communist plot, the start of the Red Terror from which only he could save Germany. The Nazis won the election, and the Reichstag empowered Hitler to govern by decree.

When Hindenburg died in 1934 Hitler took over the power of president as well as chancellor. He became undisputed dictator of Germany (*see* Dictatorship).

Brutal Régime

Hitler began a reign of terror for all who opposed

his fanaticism The Nazis seized the property of Jews and sent thousands to concentration camps where they were tortured Storm troopers seized the funds of trades unions and Communists Thousands of German citizens including eminent scholars fled the country

On June 30 1934 Hitler ordered a blood purge of even the Nazis In one day over a thousand people including many of his early supporters were massacred

To bind the masses to the Nazi program Hitler set up a propaganda ministry under fanatical Paul Goebbels It controlled even art and the theater and tried to influence the churches It taught children to report their parents of suspected disloyalty to Hitler

Organized training of youth began at the age of ten At 14 boys entered the Hitler Youth and girls joined the League of German Girls After the youth groups boys and girls went to labor camps Then the boys went into the army

The Nazis set up *cells* or small groups of party members in every office factory and rural district to see that the people upheld Hitler An aide Heinrich Himmler organized secret police the dreaded Gestapo Robert Ley led the chauvinistic Strength through Joy organization which provided low cost recreation for German workers Unscrupulous Hermann Goering dictated national economy Defying the Versailles Treaty Hitler rearmed Germany By 1936 factories throbbed with war industries and Germany was stocking up against a possible blockade Hitler forbade farmers to leave the land workers to change jobs He set prices and wages banned unions and strikes and ordered what manufacturers must produce

Expand!

Most Germans accepted this virtual serfdom in return for Hitler's pledge to restore Germany's prewar prestige and military power When the Allies banned rearmament Hitler led Germany out of the League of Nations in 1933 In 1936 his troops occupied the demilitarized zone of the Rhineland He then formed an alliance with Italy the Rome-Berlin Axis Later he brought Japan Hungary and Spain into an anti Comintern pact which was designed to prevent the spread of Communism

By 1938 he commanded the most powerful mechanized army and largest air force in the world England and France woefully unprepared were forced to a policy of appeasement They offered no opposition when Hitler seized Austria in March 1938 In September in the hope of averting war they signed the Munich Pact giving the Sudeten lands of Czechoslovakia to Germany In March 1939 Hitler seized nearly all Czechoslovakia and took the former German district of Memel

Hitler seemed able to get anything he wanted without war The Nazis sang Today we own Germany tomorrow the whole wide world Hitler demanded that Poland give him Danzig and other territory Poland refused Britain and France had pledged aid to Poland and warned Hitler

Launches Second World War

Secretly Hitler made a nonaggression pact with Russia designed to prevent a second front in the event of war with Britain and France Then on Sept 1 1939 his troops invaded Poland starting the second World War (*see* World War Second)

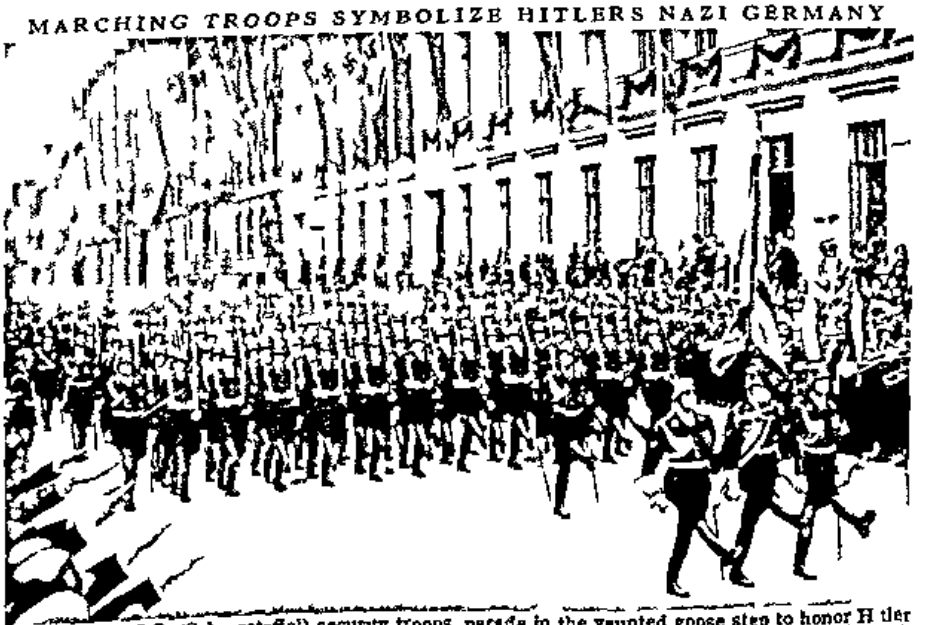
After crushing the Poles in a *blitzkrieg* (lightning war) he subdued Norway Denmark Belgium and the Netherlands France fell in June 1940 The Nazis soon got control of southeast Europe and used Italy

HINDENBURG AND HITLER



Paul von Hindenburg aged second president of Germany takes a salute in 1933 *Behind is Hitler his successor* in 1934

MARCHING TROOPS SYMBOLIZE HITLER'S NAZI GERMANY

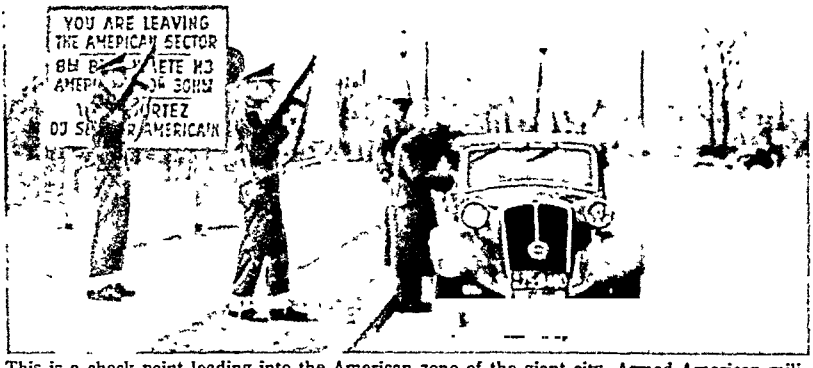


Companies of SS (Schutzstaffel) security troops parade in the vaunted goose step to honor Hitler on his 50th birthday April 20, 1939 This was just five months before Hitler invaded Poland launching the second World War At the right is the Berlin chancellery later ruined in the war

favored a decentralized federal republic. France wanted a loose federation of German states. Russia demanded a highly centralized government.

Fixing Germany's boundaries was another grave problem. Poland regarded its acquisitions as final, despite an American announcement that revision would be considered. Belgium, Luxemburg, the Netherlands, and Czechoslovakia demanded buffer zones. France claimed a customs union with the Saar. It also wanted to internationalize the Ruhr and to occupy the Rhineland permanently. Russia demanded 10 billion dollars of reparations in industrial goods from Germany.

ROAD BLOCKS DIVIDE CONQUERED BERLIN INTO FOUR SECTORS



This is a check point leading into the American zone of the giant city. Armed American military police watch as a German policeman checks the identity of people in the small European car. A sign in three languages warns Berlin traffic of the end of the American zone.

When the Allies failed to agree, the Soviet zone withdrew from almost all communication with the American and British zones. France disagreed with both groups. But in 1948 the French joined their sector to "Bizonia," making it "Trizonia," or Western Germany. Participation in the European Recovery Program aided the recovery of Western Germany. Russia refused to let Eastern Germany get ERP aid.

"Cold War" Leads to "Air Lift"

When the Western Allies stabilized the currency of Western Germany in 1948 without Russia's consent, the Soviet Union left the Allied Control Council and the Berlin Kommandatura. Russia then defiantly imposed a transportation blockade on the freeway into Berlin. This shutdown on supplies threatened to starve West Berlin. Russia seemed determined to drive the Western Allies out of Germany by a "cold war."

But the blockade succeeded only in at last unifying the Western Allies. They at once pooled their resources in a gigantic "air lift." To feed 2,500,000 Germans and Allied personnel in their jurisdiction, hundreds of American, British, and French planes flew "Operation Vittles." They carried not only food and clothing and medicine but also coal and even machinery to West Berlin. On May 12, 1949, the 328th day of the air lift, Russia removed the blockade. Its satellites needed the industrial goods of West Germany.

Divide Nation into Two New States

But Russia's obstructionism had already shown that Germany could not soon be unified politically into one national government. To speed recovery in their zones, the Anglo-American and French authorities permitted West Germany to become a republic.

This Federal Republic of Germany began on May 20, 1949. Its constitution provides for a federal diet, *Bundestag*, elected by universal vote, and a federal council, *Bundesrat*, composed of members in the government of the *Länder*, or states. The diet passes the laws, but the council has a limited veto. Members of the federal government elect the president of the republic for five years. Bonn is the capital.

Russia made a quick counter move. On May 30 Communist Germans ratified a constitution, which changed East Germany into the German Democratic Republic, effective October 7, despite a large non-Communist vote against it. East Berlin became capital of the puppet "republic." Thereafter, elections in East Germany were rigged as in other dominated nations behind the "iron curtain."

East Germany created an armed "police force" and a secret police like the old, terrifying Gestapo. Communist propaganda and spectacular mass meetings lured many restless young people into a national uniformed group called "Free German Youth," much like the fervid Hitler organization. In 1950 they threatened to seize West Berlin, but backed down when Allied authorities said they would resist.

West Germany (Federal Republic) enjoyed wide political freedom. But the Allies continued to control industrial production. To aid economic recovery, they stopped dismantling factories. With the Benelux nations, however, they set up an International Authority for the Ruhr. This allocated coke, coal, and steel to keep Germany from producing armaments. West Germany made substantial economic gains, and in 1950 it voted to join the Council of Europe.

West Germany Increases Activity in Europe

West Germany moved steadily to greater participation in the life of western Europe. All the nations which had fought Germany in the second World War ended the state of war in 1951. The United States, one of the last to act, proclaimed the termination on Oct. 20, 1951.

In 1952 the Allies urged West Germany to join a European army raised to guard against Communist attack. Russia then proposed a pact to unify East and West Germany into one nation, forbidden to join any alliance against Russia. The Allies then offered a "peace contract" to West Germany. Refugees from East Germany kept streaming into West Berlin in 1953. West Germany joined the European Coal and Steel Community in 1953.

Thousands of East German workers rioted against their Communist puppet government in 1953 In an effort to stir discontent in West Germany Russia in 1954 ' recognized ' East Germany as a sovereign nation ' but kept Soviet troops there West Germany ignored the sovereignty gesture and ratified the Allied peace contract It also agreed to join the European Army when the Allies set up that force

REFERENCE-OUTLINE FOR STUDY OF GERMANY

THE LAND AND THE PEOPLE

I Location and size G 87 9 location in world map W 205 in Europe maps E-416 424-5 political divisions map G-88 occupation zones map G-89, air distances polar projection map A 531

II Historic divisions Prussia P 424-424a Hanover H 260 Bavaria B-82-4 Baden B-15 Saxony S-52-3 Hamburg H 251 2 Bremen B-300 See also names of historic divisions in Fact-Index

III Structure of the land G-89 list G 87
- A Highlands G-89 Alps A 179-80 Black Forest B 203-4 Harz Mountains H 280
- B Rivers and lakes *G 89* Rhine R-133-4 Elbe E-288 Danube D 15 16
- C Coast line G 89 North Sea N 298 Baltic B-37

IV Climate G 89-91 map E-429 rainfall map E-420

V People G 87 91 2 pictures G 90 91 93 94 B-83, B-129 holidays F 59 (Christmas C-294b)

VI Resources and industries G 92-4 list G-87
- A Agriculture G 92-3 B-15 B-82 S-53
- B Forests and fisheries G 93 B 203 N 298
- C Minerals and mining G-93 H 279 B-82 S-53 E-398 map E-429*d* bismuth B-198 potash *P-390*
- D Manufacturing E-398 G-93-4 D 143 D 166, B 15 *B-84 P-424a S-53* picture *E-429b*

VII Trade and transportation G 94-5 railways B 127 canals G 94 picture G 92 See also in Fact-Index Trade table

VIII Principal cities list G-87 Berlin B 126 Aachen A 1 Bonn B 228 Bremen B-300 Cologne C-385 Dresden D 143 Essen E-398 Frankfort F 278 Hamburg H 251 Hanover H 260 *Heidelberg* H-329 Leipzig L-158 Munich M-449 Nuremberg N 313

IX Education and the arts education G 95 H-330 pictures G 94 101 language and literature G-82-6, outline L-99 See also in Fact-Index Germany *subheads* architecture art and music

HISTORY

I *General* G 96-103 See also the Reference-Outlines for *Middle Ages* and *Renaissance* and Reformation

II Early Germanic peoples G 96 migrations into Roman Empire G-96 M 236-7 D-431 2 Goths G 143 invasion of Huns H-451 conversion to Christianity G 96 B-228 M 237 Dark Ages W 211 M 237

III Charlemagne s empire C 186-8 M 237 Partition of Verdun—start of modern Germany *G 96 D-432*

IV *Feudalism after Frankish empire* G 96-7 F-60-2 stem duchies G 96 Bavaria B-84 Saxony S-53

V *Holy Roman Empire G 96-7 H 403-9 O-430* H-334
- A Investiture conflict *H-334-5 G-214-15*
- B Hohenstaufens H-406 rivalries of Guelfs and Ghibellines G 222*d* Frederick Barbarossa F 281, Frederick II F 281 2 N-5
- C The Great Interregnum (1254 73) A-496 G 97
- D Hapsburgs H 261 2 Frederick III F 282 *Charles IV issues the Golden Bull G 97* electoral city of Frankfort F 278

VI The Hanseatic League H 260-1 B-300 H 252

VII The Crusades C-520-2 Teutonic Knights C-522 523

VIII Reformation and religious wars G 97, R-91 3 Luther L-352-3 Charles V C-189 F 275 A-497 Thirty Years War T 118-19 G 233 4 A-497

IX Rise of Prussia G 97 P-424-424*a* H-406 Berlin—the Hohenzollern capital B-126-7
- A Frederick William, the Great Elector P-424*a*
- B Frederick the Great F 282 seizes Silesia—War of the Austrian Succession M 95 Seven Years War *S-107 8*
- C Wars with revolutionary France F 293 294
- D Napoleonic Wars G 97 P-424*a* N 8-11 E-433 Holy Roman Empire ends N 9 A-498 Congress of Vienna E-433 V-471 German Confederation G-97 F 278-9 Holy Alliance formed A 147 *E-433*

X Unification of Germany G 97
- *A Revolution of 1848 P-424a G 97*
- B Bismarck G 97 B-197 8 W 135-6 P-424*a*
- C War with Denmark D-71 2
- D Seven Weeks War with Austria G 97 B 198
- E Franco Prussian War F 277 8 B 198 South German states join Prussia G-97 B 84 Treaty of Frankfort F 278 A 181
- F King William I P-424*a* V-463 W 135-6

XI The Empire (William I Frederick III William II) G-97 W 136 Bismarck falls from power B-198
- A Colonial expansion G 97 Africa A 52 map inset A 43 (Moroccan incidents M 395 R-222) South Seas P 11 H 276 S-35 Far East S-134 Near East B 26 B 16
- B Triple Alliance and Triple Entente T 177 E-434
- C Road to war G 97 8 W 215 19 E-434 F 276
- D World War I W 215-32 chart H-366-7 See also war chronology in Fact-Index
  - 1 Campaigns and leaders W 219-32 A 111 A 235 M 185 A 388 M 98-9 S-22-3 S-235-6 V-450-1 Y-344 Hindenburg H-336-7
  - 2 Revolution of 1918 W 231 2 W 136 B 128

XII Weimar Republic G 98 Hindenburg H 356-7
- A Peace treaties W 239-40 reparations W 241-3
- B Demands for treaty revision W 244
- C League of Nations (1926 33) G-99 picture *W-242*
- D Hitler becomes chancellor G 98 H 357, H-385 *picture G-99*

XIII The Third Reich G 98-100 H 383-5 Nazis seize control G-98-9 Saar plebiscite—Rhineland reoccupied W 244 G 99 Jewish terror J-354 G 98-9
- A Expansion leads to war G 99 Rome-Berlin Axis Anti Comintern Pact E-435-6 I 275 Austria annexed A-495 Munich Pact D-371, F 272 E-436 C-183 C-536 G 99

B. World War II W-245-72, 276-84, 294-6, E-371. See also in Fact-Index Germany, history of, subhead World War II; and the World War II chronology in the Fact-Index

XIV. Occupied Germany G-100-2, map G-89
- A. Potsdam Conference G-100
- B. War crimes trials W-299*a*, G-101
- C. Territorial losses G-100, map G-88
- D. Economic stagnation G-101
- E. "Cold war" and "air lift" G-102, B-130
- F. West Germany (Federal German Republic) granted autonomy in 1952 G-102

BIBLIOGRAPHY FOR GERMANY

Books for Younger Readers

Benary-Isbert, Margot. The Ark (Harcourt, 1953).
Berner, E. R. Germany (Holiday, 1951).
Gág, Wanda, tr. Tales from Grimm (Coward-McCann, 1936).
Goss, M. B. Deep-Flowing Brook: the Story of Johann Sebastian Bach (Holt, 1938).
Kästner, Erich. Emil and the Detectives (Doubleday, 1930).
Kästner, Erich. Lisa and Lottie (Little, 1951).
Wheeler, Opal. Ludwig Beethoven and the Chiming Tower Bells (Dutton, 1942).

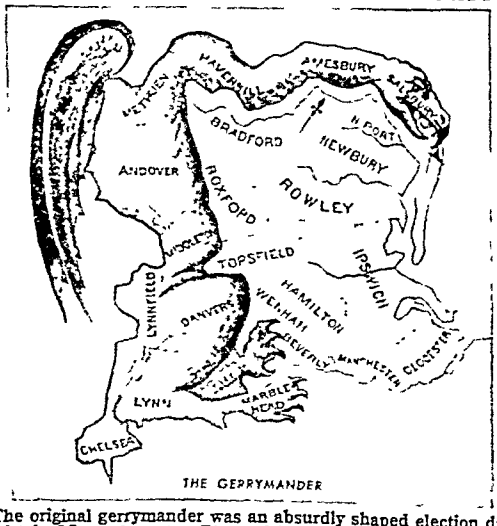
Books for Advanced Students and Teachers

Burch, Gladys. Richard Wagner (Holt, 1941).
Clay, L. D. Decision in Germany (Doubleday, 1950).
Dickinson, R. E. Germany, a General and Regional Geography (Dutton, 1953).
Pollock, J. K. and Thomas, H. L. Germany in Power and Eclipse (Van Nostrand, 1952).
Reinhardt, K.F. Germany: 2000 Years (Bruce, 1950).
Riess, Curt. The Berlin Story (Dial, 1952).
Robertson, J. G. History of German Literature (Putnam, 1931).
Schuman, F. L. Germany Since 1918 (Holt, 1937).
Shirer, W. L. Berlin Diary . . . 1934–1941 (Knopf, 1941).
Shirer, W. L. End of a Berlin Diary (Knopf, 1947).

GERRYMANDER (*jĕr' ĭ-măn-dĕr*). In 1812 the Democratic-Republican party was in power in Massachusetts but could not hope to retain its control in the approaching elections. To save something for the party Gov. Elbridge Gerry signed a reapportionment bill constructing at least one election district of exceptional unfairness. An exasperated Federalist editor hung a map showing this district over his desk. Gilbert Stuart, the painter, noticed the monstrosity one day and added head, wings, and claws, exclaiming, "That will do for a salamander." "Better say Gerrymander," growled the editor. The name for this political trick subsequently passed into common use.

The "gerrymandered" district may be a city ward, a legislative district, or a congressional district. The purpose is to pack hostile majorities into two or three districts, leaving the rest "safe" for the party in power and thus giving it a larger number of representatives than its votes really warrant.

THE GERRYMANDER—A POLITICAL BEAST



The original gerrymander was an absurdly shaped election district in Massachusetts. The article tells how it got its name.

GERSHWIN, GEORGE (1898–1937). Americans had been singing and playing jazz tunes a long time before George Gershwin began composing. He was one of the first, however, to use jazz themes within classical forms. Today Gershwin's 'Rhapsody in Blue' and his Negro folk opera 'Porgy and Bess' are highly regarded both by serious students of music and by those who love catchy melodies and engaging rhythms. His musical comedy songs have remained popular for many years.



Gershwin was born in Brooklyn, N. Y., on Sept. 26, 1898. Soon after, the family moved to the lower east side of Manhattan, where Morris Gershwin had a small chain of restaurants. George grew up as a typical city boy. When he was 12 years old, his parents bought a piano for his older brother, Ira. George astounded the family by picking out the tune of Rubenstein's 'Melody in F'. He had learned it by watching a player piano in a penny arcade.

He took piano lessons from neighborhood teachers and later studied under Charles Hambitzer, a well-known musician. Altogether, however, his formal training was slight. At the age of 16 he quit high school to work as a "song plugger" for a music publisher, playing new songs for prospective buyers.

Gershwin's first song was published in 1916, and at 21 he wrote his first musical comedy, 'La La Lucille'. That same year his 'Swanee', popularized by Al Jolson, became a nationwide favorite.

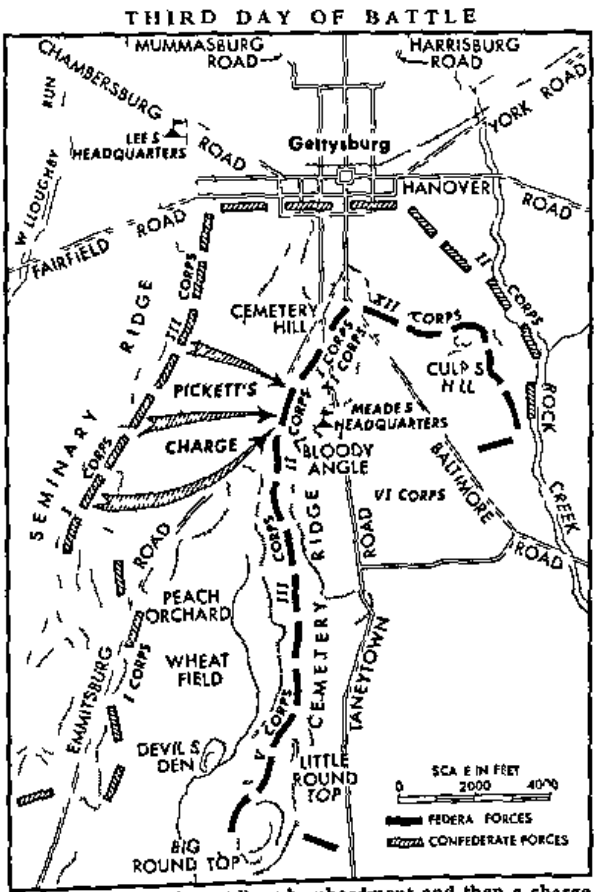
In 1924 Paul Whiteman commissioned Gershwin to write a short composition for a jazz concert to be given in New York's Aeolian Hall. Gershwin, hard at work on a musical comedy, barely finished the 'Rhapsody in Blue' in time for the concert. Its first reception was mixed, but Walter Damrosch asked him to

compose a piano concerto for the Symphony Society of New York The result was the 'Concerto in F' In 1928 Gershwin went abroad to study composition But European composers and teachers advised him to follow his own methods On this tour he wrote 'An American in Paris Gershwin's most successful musical comedy was Of Thee I Sing', which was a pleasant satire on presidential campaigns His last major work was Porgy and Bess' He died at 38 of a brain tumor on July 11 1937

GETTYSBURG—*the* TURNING POINT *of the* CIVIL WAR

GETTYSBURG, BATTLE OF On the first three days of July 1863 at the little crossroads town of Gettysburg Pa , was fought the most important battle of the Civil War Lee s Army of Northern Virginia had crossed the Potomac and marched into Pennsylvania It threatened Harrisburg the state capital and the North feared that the army might devastate Philadelphia and Baltimore Government leaders were even fearful that Washington itself, although protected by the powerful Army of the Potomac, might be taken

Lee's invasion had two all important strategic purposes The Confederacy hoped it would stir the people of the North to demand peace at any cost and would persuade England and other European nations to recognize the new government The South was at the peak of its power Its defeat at Gettysburg and the surrender (July 4, 1863) of Vicksburg began the misfortunes that ended with Lee s surrender two years later at Appomattox



Lee s plan called for artillery bombardment and then a charge against the Federal center Pickett s 15 000 infantrymen screaming the spine-chilling rebel yell advanced across the open and up Cemetery Ridge Many reached Bloody Angle in spite of terrific Federal fire but then faltered broke and retreated The battle ended a great Federal victory

Positions of the Armies on June 30

Lee s army was made up of three corps I Corps under Gen James Longstreet, II Corps under Gen R S Ewell, III Corps, under Gen A P Hill Ewell s corps had threatened Harrisburg Philadelphia and Baltimore On June 30 it lay north of Gettysburg Hill s corps bivouacked at Cashtown, between Chambersburg and Gettysburg Longstreet's corps camped in and near Chambersburg General 'Jeb" Stuart Lee's chief of cavalry, was raiding the country east of Gettysburg and was out of touch with the Confederate commander

The Union army was made up of seven corps, each about half the size of a Confederate corps, plus cavalry Under a new commander, Gen George G Meade, the army marched north to intercept Lee its movements limited by the need to protect Washington On June 30 a brigade of Hill s corps intent on raiding stores at Gettysburg observed Union cavalry in its way and retired with the news to Cashtown

First Day of Battle

On July 1 Lee sent one of Hill s divisions toward Gettysburg It clashed with Federal cavalry and infantry at Willoughby Run immediately west of Gettysburg The fighting was severe and Hill s men were at first repulsed Then units of Ewell's corps coming from the north turned the Federals north flank The Federals were driven east and south over Seminary Ridge and through the town They took refuge on Cemetery Hill a half mile south of town Ewell although commanded by Lee to take Cemetery Hill "if possible" failed to drive forward and the Union army gathered its strength on the hill and extended defensive lines south along Cemetery Ridge

By nightfall the Confederates had captured some 5 000 prisoners and inflicted considerable damage on the Federal units They gathered on the battlefield more swiftly than the Federals and took positions on Seminary Ridge and immediately south and east of town The battle line shaped up in the form of a fishhook, with the shank extending south along Cemetery Ridge and the curved hook bending east from Cemetery Hill to Culp s Hill Lee still without cavalry, was hampered by lack of knowledge of Federal movements and strength Nevertheless, he determined to fight and ordered Longstreet to attack on the morning of July 2

Second Day of Battle

Longstreet disgruntled because Lee had rejected his alternative battle plan, was slow in attacking

Meanwhile, the Union army steadily built up strength along Cemetery Ridge and fortified the Peach Orchard, a height west of the Ridge.

Longstreet did not begin the battle until four o'clock in the afternoon. He was repulsed from Little Round Top but took the Peach Orchard. One unit even reached the Union line atop Cemetery Ridge but had to withdraw. To the north and east the Confederates limited the attack to a cannonade until six o'clock. Then Ewell made unsuccessful attacks on Cemetery Hill and Culp's Hill.

In spite of repulse, Lee determined to carry on the battle. He ordered Longstreet to throw Pickett's division at the center of the fishhook's shank and to support this drive with other units of his corps. He also assigned units from Hill's corps to join in the attack. In the late afternoon of July 2, Stuart's exhausted cavalry joined Lee. Along Cemetery Ridge the Union forces continued to build up their strength.

Last Day of Battle

Again, the next day, the start of battle was delayed. It was not until 1:00 P.M. that the Confederate cannon began to throw shells at Cemetery Ridge. Union guns answered fiercely, and soon the battleground was overlaid with heavy clouds of smoke and dust. After a time Meade slowed the Federal fire to conserve ammunition. The Confederates thought the fire lessened because their own cannonade had destroyed a large number of Federal guns.

At two their attacking force, 15,000 men in splendid alignment, began the advance. Union grape and canister tore great holes in the advancing line, but the Confederates closed the gaps and marched on.

Union skirmishers retreated behind the stone wall on Cemetery Ridge, and Union rifles began to take toll. Nevertheless, the Confederates came on. They halted once—to fire their rifles—and then lowered their bayonets, screamed the rebel yell, and came on at a run. The Federals retreated from the sheltering stone wall before this furious attack. From either flank Federal cannon and rifle fire enfiladed the Confederate advance. It was too punishing, and the Confederates withdrew in some disorder.

Battle Costs and the Retreat to Virginia

Lee's Army of Northern Virginia totaled about 75,000 officers and men; Meade's Army of the Potomac, about 88,000. The Confederate loss in dead, wounded, and missing was about 28,000; the Union loss, about 23,000. After the battle Lee could not hope to maintain his defeated army in enemy territory.

During the night of July 3 and the morning of July 4, the Confederate wounded were loaded aboard ambulances and wagons. These and supply wagons began the journey west beyond the mountain curtain and south. Rain impeded the disengagement. Lee prepared his line on Seminary Ridge against Union attacks. But none came. On the morning of July 5 he finished his withdrawal and, covered by Stuart's cavalry, began the retreat to Virginia. At the Potomac he was held up by loss of a pontoon bridge and high water. Meade's pursuit was slow. Lee got most of his men safely across the river.

Meade has been severely criticized for his failure to closely pursue Lee's army. But his army too had been badly hurt. The belief that the Civil War could have been ended by a vigorous pursuit of the defeated Confederates is after all but a guess.

Today the little town of Gettysburg stands amidst many memorials of the great battle. At the dedication Nov. 19, 1863, of a national cemetery atop Cemetery Hill, President Lincoln delivered his famed Gettysburg Address (*see* Lincoln). In 1895 the battlefield became a national military park; on it have been erected more than 2,000 memorials of various kinds and sizes. In 1938 the Eternal Light peace memorial was lighted. Its gas flame burns endlessly in memory of the fallen Blue and Gray soldiers. (*See also* Civil War, American; Lee, Gen. Robert E.; Meade.)

GEYSER (*gī'zĕr*). A hot spring that spouts steam and water is called a geyser. The name comes from the Icelandic word *geysa*, which means "to rush furiously." Geysers occur in regions of relatively recent volcanic activity, where rock not far below the surface is still very hot. Geysers are found in Yellowstone National Park, Iceland, and New Zealand.

The mouth of a geyser is either a funnel-shaped crater or a built-up cone, made up of silica and other minerals brought up by the steam and water. Some geysers spout only a few feet, others hundreds of feet. Some spout infrequently, others at short intervals. Yellowstone's Old Faithful spouts approximately every 65 minutes.

Why a Geyser Spouts

Two theories of geyser action have been offered. In 1846 Robert Bunsen stated that water was kept in contact with hot rocks near the bottom of a geyser tube by the pressure of water above. Water under heavy pressure can boil only at temperatures higher than the sea-level boiling point of 212° F. Consequently, the water reached *superheat* before boiling and turning into steam. When steam was produced, it pushed the top water out of the tube, thus lessening the pressure below. Because of the lighter pressure all the superheated water exploded into steam and rushed out of the tube.

A. L. Day and E. T. Allen, from their study of Yellowstone geysers in 1936, believe that there are connecting tubes or chambers. Steam is generated by hot rock in one, and when the pressure of the steam is great enough it rushes into the other, pushing the water above the junction into the air. (*See also* Yellowstone National Park; Iceland; New Zealand.)

GHENT (*gĕnt*), BELGIUM. The port city of Ghent stands at the meeting of the Lys and Scheldt rivers in western Belgium, a few miles from the sea. A great canal gives ships passage to its docks. A network of smaller canals within the city is spanned by more than 200 bridges. Ghent's trade is largely agricultural and manufactured products. Because it also exports great quantities of flowers, it sometimes is called the "City of Flowers." Ghent's chief modern

industries are cotton and flax spinning cotton printing and sugar refining It has a national university

Medieval Ghent was a prosperous center of the cloth industry Within the old city's eight-mile circumference lie extensive promenades large gardens and many old buildings In its center surrounded by walls and moats are the famous Cathedral of St Bacon, guild houses monasteries and a 13th-century nunnery 'Roland" a bell that called Ghent s men to arms when danger threatened still hangs here In the Middle Ages Ghent s turbulent wealthy burghers quarreled endlessly with their lords But when the rival city of Bruges threatened Ghent s lords and burghers united to fight a common enemy The treaty that ended the War of 1812 was signed here Population (1947 census), 166 096

GHIBERTI (*ge bĕr'te*), **Lorenzo** (1378–1455) Michelangelo said of the bronze doors Lorenzo Ghiberti made for the Baptistery in the Italian city of Florence "They are beautiful enough for the gates of Paradise" Their creator a sculptor, painter and metalworker, was a leader in the Renaissance

Ghiberti, like many of the Renaissance artists was trained in gold working His master was his stepfather, Bartoluccio In 1400 Ghiberti left Florence to escape the plague but he returned to enter a contest sponsored by the merchant guilds to select a designer for two bronze doors The contestants were to depict on a panel the Sacrifice of Isaac Even Ghiberti s closest rival, Brunelleschi later a famous architect, admitted the superiority of Ghiberti's panel

Ghiberti was aided on the doors by his stepfather and his son The panels depict stories of Christ and the Church Fathers The project took 21 years Meanwhile Ghiberti completed much other work

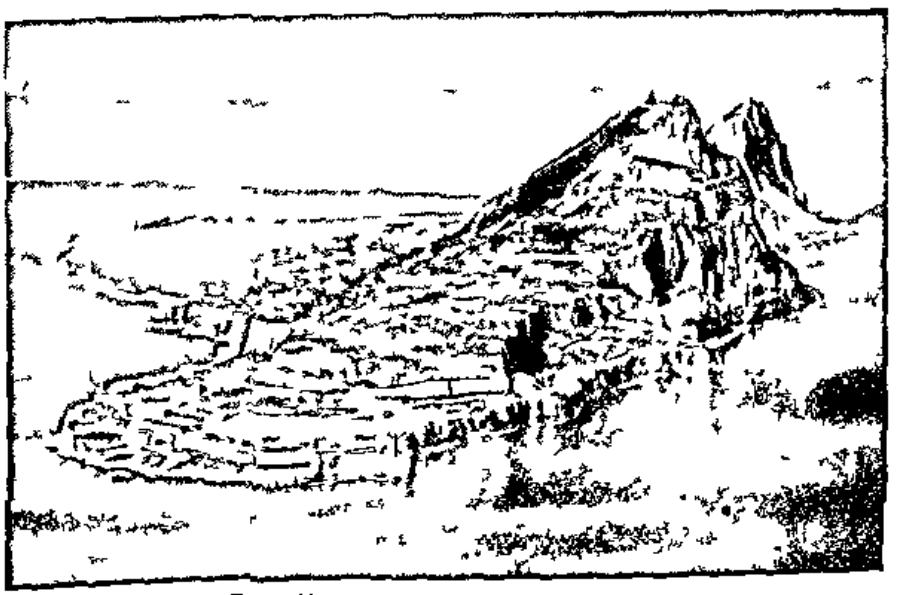
After the doors were installed, Ghiberti was commissioned to make a second set These, the ones that evoked Michelangelo's praise took 29 years to complete The panels depict Old Testament stories Bordering strips carry sculptured heads in high relief of Ghiberti and men of his time (For picture, *see* Renaissance) During World War II the doors were hidden for safekeeping Before they were reinstalled they were cleaned It was then discovered that the gold leaf with which they were originally covered was almost intact Ghiberti also wrote a history of art This manuscript still exists His and Brunelleschi's contest panels are displayed in the National Museum in Florence Ghiberti died Dec 1 1455

GIBBON The smallest and least known of the anthropoid apes the gibbon is in some ways the most manlike The several species are native to Southeast Asia One of the commonest is the white handed gibbon (*Hylobates lar*) It grows 2½ to nearly 3 feet tall, but weighs only 8 to 12 pounds It has a fringe of white hair around a black naked face and white or straw-colored hair on top of its hands and feet Its arms are very long The male s thick woolly coat is generally black the female s often tawny or yellowish

The gibbon lives mostly in trees It can swing 20 to 40 feet from one branch to another The gibbon sits as erect as a man It eats leaves fruits spiders birds and eggs It makes no home but sleeps on any convenient branch The male his mate and their young are always together The young remain until they find mates of their own usually at the age of six Thus a family may contain 8 or 9 individuals In the wilds a gibbon lives to be 20 to 30 years old but in a zoo its life is much shorter (*See also* Ape)

GIBRALTAR Near the southern tip of Spain a narrow peninsula points a finger to the coast of Africa, 15 miles away Here the Rock of Gibraltar guards the western gateway to the Mediterranean Since 1704 Gibraltar has been a fortress a crown colony of Great Britain and its chief naval base on the route through the Suez Canal to the Far East

The peninsula about three miles long and less than a mile wide covers about two square miles The rock, mostly limestone is honeycombed with tunnels and a few natural caves The sides are studded with guns pointing to land and sea the top bristles with anti-aircraft guns The steep eastern slope rises *1 400*



THE ROCK OF GIBRALTAR
The British fortress of Gibraltar guards the western entrance to the Mediterranean. In the background is the coast of Spain The Rock rises 1 400 feet above the sea.

feet above the Mediterranean. At the north end of the peninsula an uninhabited strip between British and Spanish boundaries is designated "neutral ground."

The city of Gibraltar, mostly on level ground on the west of the rock, lies on the deep Bay of Gibraltar. Its industries are unimportant, but the harbor is a port of call where passenger and cargo ships take on fuel, stores, and water. Vast reservoirs for rain water have been blasted out of solid rock, and artesian wells have been drilled in the tunnels.

Aliens must have a British permit to live on the peninsula. Gibraltar and the opposite cape of Africa (which holds the Spanish town of Ceuta) were called "Pillars of Hercules" by the Greeks. They did not dare sail beyond. The name "Gibraltar" is a corruption of Jebel-al-Tarik (hill of Tarik). Tarik, a Mohammedan, led troops across the straits in A.D. 711 and built a fortress on the rock. Since its capture by the British in 1704, Gibraltar has withstood a number of sieges. In the greatest (1779–83) the British held off combined French and Spanish forces. During the second World War Gibraltar was a naval and air base. These bases were important in the invasion of Africa in 1942. It withstood many air bombings. Population, including garrison (1951 census), 23,232.

GILBERT AND SULLIVAN



Their zany, fun-loving, and lilting light operas have delighted the world for many years.

GILBERT and SULLIVAN. Since 1875 the rollicking comic operas of Gilbert and Sullivan have played to millions of people all over the world. Between 1871 and 1896 the two created music and words for 13 operas. All except three have been revived again and again.

Gilbert was the librettist. His amusing, hilarious rhymes and tricks of phrasing colored and gave variety and vigor to his topsy-turvy plots. Sullivan wrote the music. His lighthearted tunes have been hummed, whistled, and played ever since. Although in collaboration the two perfectly complemented one another, they were physically and characteristically unlike. Gilbert was tall, sour, brusque, and irascible; he married in 1867. Sullivan was small, dark, suave, and pleasant; he never married. Gilbert was impatient with royalty and officialdom; Sullivan was a friend of the Prince of Wales and other royalty. These differences made for frequent spats.

William Schwenk Gilbert (1836–1911) was first a government clerk, then a lawyer, and finally a dramatist. He was born Nov. 18, 1836, in London. While at Ealing School he wrote several student dramas. He attended King's College. The verses he wrote while studying law, first published in papers and magazines, were collected in two books, 'Bab Ballads' and 'More Bab Ballads'. Until he collaborated with Sullivan, he was a successful but not outstanding dramatist.

Arthur Seymour Sullivan (1842–1900) was Victorian England's most famous composer of popular and sacred songs and oratorios. 'Onward! Christian Soldiers' is his best-known hymn; 'The Lost Chord' is one of his popular songs. Sullivan also was born in London, on May 13, 1842, the son of a poor Irish musician. As a boy, he was a soloist with the Chapel Royal choristers. His pleasant manner and superior talents won him scholarships at the Royal Academy of Music in London and at the Leipzig Conservatory in Germany. His 'The Tempest', based on the Shakespearean play of that name, won him fame before he was 20 years old.

Gilbert and Sullivan met in 1870, and within a year their first opera 'Thespis' was played. It was not successful, and the two did not again join efforts until 1875. Then they created 'Trial by Jury', which poked fun at the judiciary. The opera's one act played only 45 minutes, but it attracted large audiences.

They had written it for Richard D'Oyly Carte, a theatrical producer. Within three years he formed the famous D'Oyly Carte Company to produce Gilbert and Sullivan operas; and producer, writer, and composer alone shared the large profits.

Their most successful operas are: 'The Sorcerer', 1877; 'H. M. S. Pinafore', 1878; 'The Pirates of Penzance', 1879; 'Patience', 1881; 'Iolanthe', 1882, thought to be their finest; 'The Mikado', 1885, their biggest success; 'The Yeoman of the Guard', 1888; and 'The Gondoliers', 1889, another great success. After 'The Gondoliers' the partners quarreled furiously—over who should pay the cost of new carpeting for their theater, the Savoy. The failure of 'Utopia Limited', 1893, and 'The Grand Duke', 1896, probably can be blamed on this quarrel.

Before Gilbert and Sullivan, England had produced few noteworthy comic operas, and the best were but poorly realized and staged. Gilbert's topsy-turvy plots, zany rhymes, and careful staging and Sullivan's superb music established a new art form. The essence of Sullivan's music cannot be given in words, but Gilbert's uproarious verse can. In 'H. M. S. Pinafore' the first Lord of the Admiralty sings of the reason for his success:

I cleaned the windows and I swept the floor,
And I polished up the handle of the big front door.
I polished up the handle so carefullee
That now I am the Ruler of the Queen's Navee!

and in 'The Pirates of Penzance' the pirates are forgiven because—

They are no members of the common throng;
They are all noblemen who have gone wrong!

Gilbert's caricatures of government and officials angered Queen Victoria. Sullivan was knighted by Queen Victoria in 1883. Gilbert had to wait for Edward to ascend the throne; he was knighted in 1907. Sullivan died Nov. 22, 1900; Gilbert, May 29, 1911.

GINGER The spicy flavor of ginger is found in cakes and cookies, pickles and preserves roast meats, mincemeat, and ginger ale A popular British soft drink is ginger beer Ginger is one of the oldest known spices Its use is mentioned in the ancient Sanskrit literature of India and the Greeks and Romans early imported ginger from that country During the Middle Ages it was so scarce and valuable that a pound of it was worth a whole sheep The early Spanish conquistadors planted ginger in Jamaica, and by 1550 Jamaica was exporting it to Europe in large quantities Today ginger is grown in the West Indies, China the Indian peninsula, and West Africa

The scientific name of the ginger plant is *Zingiber officinale* It is a reedlike perennial similar to the iris or flagroot The aromatic rootstocks yield the ginger Another member of the ginger family (*Zingiberaceae*) is turmeric, the roots of which are powdered and used for medicine, for a yellow dyestuff, and for a condiment in mustard and curry powder

Green ginger preserved in sugar syrup or honey comes from China Other ginger growing countries export dried ginger in chunks or powdered form Dried ginger varies in color from light yellow to brown Jamaica ginger the best quality, is light yellow Some ginger flavoring is sold as tincture of ginger, an alcohol solution

GINKGO (*ging'ko*) Before the Ice Age the broad-trunked spreading ginkgo tree grew widely in the temperate zones of both the Northern and Southern Hemispheres Now it is native only to China and Japan In Chinese temple gardens there are ginkgos believed to be more than a thousand years old The beauty of the ginkgo foliage has brought its adoption as a shade tree in many sections In Washington, D C, the ginkgo is extensively planted along the streets and in the parks

The ginkgo grows to a height of 120 feet, with a trunk diameter up to eight feet It has numerous slender branches and fan-shaped fernlike leaves These resemble the maidenhair fern, and the ginkgo is sometimes called the 'maidenhair tree" The yellow-orange fruit resembling a plum has a disagreeable-smelling outer portion and an inner oval nut The nut contains an oily edible seed with a cornlike taste The Chinese and Japanese consider the nuts a delicacy

GINSENG For many centuries the Chinese built a host of legends and superstitions around the ginseng plant They believed that its roots were a remedy for every illness capable of prolonging life and even of restoring it after death Their legends told how wild animals protected the plants from harm and how the roots saved themselves from capture by moving from place to place underground

The beliefs arose partly from the fact that ginseng roots take curious shapes, roughly resembling the outline of a human figure The picture at the right shows some of these forms Among the ancient Hebrews the mandrake root—which also

THE SCARLET GINSENG BERRIES



After several years' growth, the ginseng plant shows a rich cluster of scarlet berries The roots are ready for gathering, and the berries will provide seeds for new plants

ODD SHAPES OF GINSENG ROOTS



The commercial value of ginseng roots lies in their odd shapes The Chinese and other Oriental people see in these roots a fancied resemblance to the human form, and from this supposed likeness comes the roots reputed powers as a medicine The lengths of the roots range from four to eight inches

assumes oddly familiar shapes—was regarded with the same awe and superstition.

Western medical scientists can find no medical value in ginseng, but the Chinese are still willing to pay high prices for it. For a time in the 19th century, the American species of ginseng, *Panax quinquefolium*, was the United States most valuable export to China. In the 1930's the United States still shipped an annual 2 million dollars' worth of ginseng. The Manchurian and Korean species, *Panax ginseng*, is even more valuable; an ounce of selected root has brought as much as $200. Both species grow wild; the American ginseng has also been cultivated for the Chinese market. Marketable roots take about six years to grow from seed.

GIORGIONE (*gōr-jō'nā*) (1478?–1510). In his own day Giorgione was hailed as one of the greatest Italian painters. He led his fellow artists away from their concentration on religious portrayals into the wider field of subjects offered by Greek and Roman mythology. Titian and later Tintoretto and Veronese were strongly influenced by Giorgione's choice of subjects and his technique (*see* Titian). Unfortunately, many of Giorgione's paintings were frescoes, made on freshly spread, wet plaster walls. Some of these wall paintings disappeared when the buildings crumbled or were wrecked. The remaining ones are faded, cracked, and peeling. Giorgione did not sign his paintings on canvas; and scholars are not sure that some works attributed to him are actually his.

Little is known of Giorgione's life. His real name may have been Giorgio Barbarelli; he was also called Giorgio of Castelfranco, from his birthplace. Giorgione means "Big George"; he won this nickname both for his size and for his reputation as a painter. He studied at the studio of Giovanni Bellini, where Titian was a fellow pupil. Giorgione was known in Venice society as an accomplished singer and lute player, fond of feminine company. He died of a plague when he was in his early 30's.

Among Giorgione's famous paintings are 'Sleeping Venus', 'The Tempest', 'Madonna with Saints', and 'Concert Champetre'.

GIOTTO (*gôt'tō*) (1266?–1337). Painter, sculptor, architect—Giotto stands out boldly as the first genius of art in the Italian Renaissance. Giotto lived and worked at a time when men's minds and talents were first being freed from the shackles of medieval restraint. He dealt largely in the traditional religious subjects, but he gave these subjects an earthly, full-blooded life and force.

Giotto's full name was Giotto di Bondone. He was born about 1266 in the village of Vespignano, near Florence. His father was a small landed farmer. Giorgio Vasari, one of Giotto's first biographers, tells how Cimabue, a well-known Florentine painter, discovered Giotto's talents. Cimabue saw the 12-year-old boy sketching one of his father's sheep on a flat rock and was so impressed with his talent that he persuaded the father to let Giotto become his pupil. Another story is that Giotto was apprenticed to a wool merchant in Florence. The boy frequented Cimabue's studio so much that he was finally allowed to study painting.

The earliest of Giotto's known works is a series of frescoes (paintings on fresh, still-wet plaster) on the life of St. Francis in the church at Assisi. Each fresco depicts an incident; the human and animal figures are realistic and the scenes expressive of the gentle spirit of this patron saint of animals.

Between 1304 and 1306 Giotto painted a notable series of 38 frescoes in the Arena Chapel in Padua. The frescoes illustrate the lives of Jesus Christ and of the Virgin Mary. Over the archway of the choir is a scene of the Court of Heaven, and a Last Judgment scene faces it on the entrance wall. The compositions are simple; the backgrounds are subordinated; and the faces are studies in emotional expression.

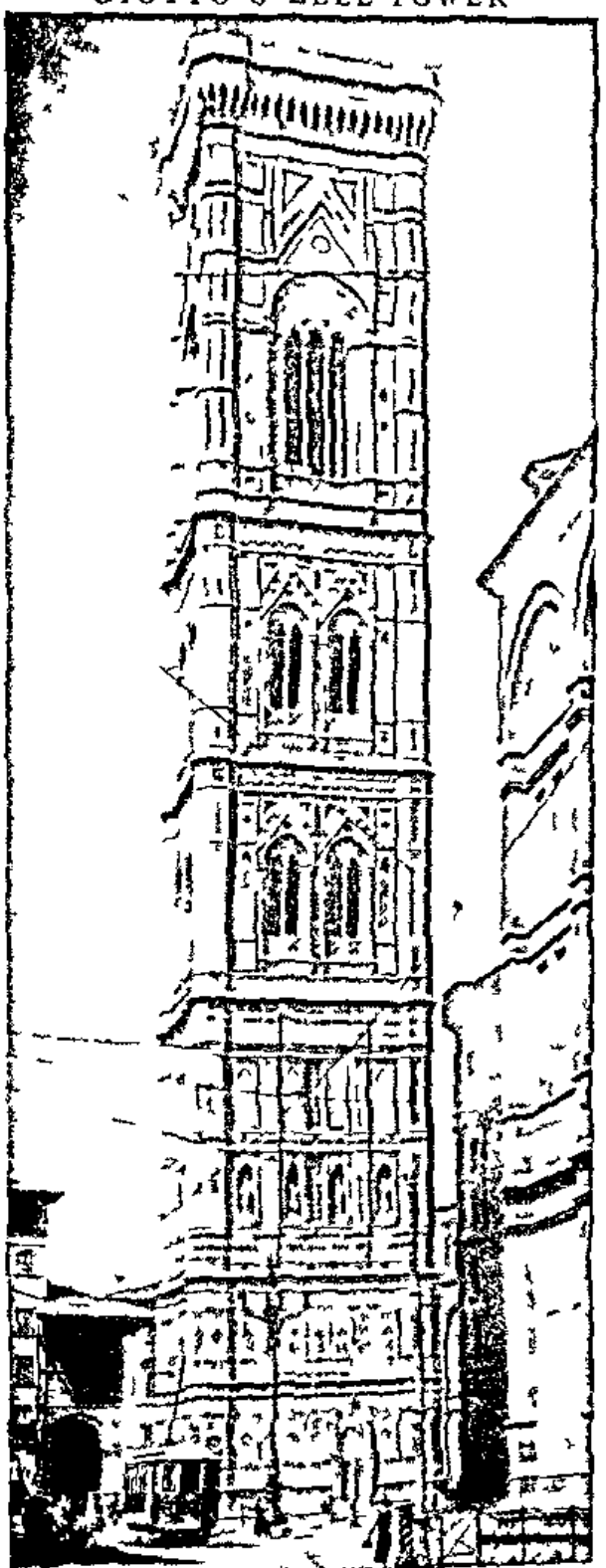
Vasari tells the story of how Pope Boniface VIII sent a messenger to Giotto with a request for samples of his work. Giotto dipped his brush in red and with one continuous stroke painted a perfect circle. He assured the messenger that the worth of this sample

GIORGIONE'S 'ADORATION OF THE SHEPHERDS'



This oil painting by Giorgione now hangs in the National Gallery in Washington, D. C. The picture shows his great skill at assembling figures and landscape into a pleasing composition.

GIOTTO S BELL TOWER



Giotto s campan le stands next to Florence s *cathedral Santa Maria del Fiore* in the *Piazza del Duomo* The tower called the finest structure of its kind in Ita y rises 292 feet and is made of red green and white marble Giotto designed the *tower and* saw it begun. It was comp eted by And ea Pisano and others after Giotto s death Visitors are afforded a fine v ew *of Florence* after climbing 414 steps to the tower s top

would be recognized When the pope saw it he in stantly perceived that G otto surpassed all other pa nters of his time

In Rome Naples and Florence Giotto executed commissions from pr nces and high churchmen In the Bargello or Palace of the Podestà (now a national museum) in Florence is a series of his Biblical scenes Among the bystanders in the pa nt ngs is a portra t of h s fr end the poet Dante The Church of Santa Croce is adorned by Giotto murals again dep ct ng the l fe of St Franc s

In 1334 the city of Florence honored Giotto with the title of Magnus Magister (Great Master) and appo nted him city arch tect and superintendent of publ c works In this capacity he des gne l the famous campan le (bell tower) He d ed in 1337 before the work was finished

Giotto was short and homely and he was a great wit and pract cal joker He was married and left s x children at l s death Unl ke many of his fellow art sts he save l his mo ey and was ac ounted a rich man He was i fam l ar terms w th the pope and King Rol ert of Naples called him a goc l fr end

In common w th otl er artists of his day Giotto *lacke l the technical knowledge of* anatomy an l per spect ve that later painters learned Yet what he possessed was infin tely g eater than the technical sk ll of the art ts who followed h m He had a grasp of human emotion an d ot w l at was s gn ficant in human life In concentrating on these essentials he created compelling p ctures of people under stress of people caught up n rises and soul searching dec sions Modern artists often seek inspirat on from Giotto In him they find a d rect approach to human exper ence that remains valid for every age (For a picture in color of The Descent from the Cross in the Arena Chapel in Padua *see* Paint ng)

GIRAFFE The tallest of all living an mals is the g raffe Even more peculiar than its s ze is the sh pe of th s African animal which has insp red amazement s nce ancient times The male g raffe may grow to be from 16 to 20 feet tall Tl e female is somewhat shorter Th s height comes mostly from its legs and neck for its body is smaller than that of the average horse The front legs may be *8 or 10 feet long* and *the neck* as long as a tall man In the neck however are only seven vertebrae—the same as in man—but each vertebra is very long Tl s makes the neck so st ff that the g raffe must spread its legs far apart in order to reach down to drink

When you watch a giraffe feed you see at once how this peculiar build enables it to get food The g raffe is a plant eater and with its great he ght it can reach up to the leaves of trees Hence it can thrive in semiarid tropical lands which have trees l ke the mimosa but l ttle or no grass

In every detail the giraffe is splendidly adapted to the tree browsing habit The tongue may be a foot and a half long and the giraffe also has a long upper lip With the two it can easily wrench loose mouthfuls of leaves The knees and hock joints

are padded with callosities like those of the camel for resting on stony or sandy ground. Finally, the thick hide is covered with short hair, mottled brown and yellow. This coloring blends beautifully with the play of light and shadow when the giraffe is browsing among mimosa trees, and the animal is all but invisible. (For picture in color, *see* Africa.)

Additional Peculiarities of the Giraffe

The eyes of the giraffe are described as wonderful in beauty of coloring and in expression. The hoofs are cleft and dainty in shape. The nostrils are prominent and can be closed at will like those of the camel.

The neck has a short soft mane. Between the ears are two bony hornlike projections covered with skin and surmounted with bristles. In front of and between these projections is a rounded bony elevation which appears like an undeveloped third horn. In one species both males and females possess horns; but usually the horns are confined to the males.

The giraffe cannot trot, but it runs in a ponderous gallop. Arabs with fleet horses can scarcely overtake it. The flesh is in great demand for food, the skin is used for leather, and the tail tuft is used for fly brushes.

The giraffe has a reputation for being voiceless because the low, throaty sound it makes is little noticed. The fawns bleat like lambs. Both sight and hearing are keen and it is very intelligent. Although it is good-natured and gentle, it will fight in self-defense. It can use the head on its long neck like a sledge hammer to deal heavy blows. It is said that in defense of her young a female giraffe has killed a lion.

THE GIRAFFE AND HIS SHORT-NECKED COUSIN





The mottled giraffe lives in open country, with occasional clumps of trees, while the okapi (at the left) is a forest dweller. The color and markings of each animal help to conceal it in its own surroundings.

Giraffes usually live in small herds. They chew their cud while standing erect, and wary hunters have sometimes come upon specimens leaning against trees, fast asleep.

Giraffes were known to the ancient Egyptians and Greeks, and many were exhibited in the old Roman games. They were thought to be a mixture of camel and leopard, and were called camelopards.

These animals formerly ranged across the African continent from the Indian Ocean to the Atlantic. Now they are confined to the plains of eastern Africa between the Sahara Desert and the Zambezi.

The Rare Okapi, Relative of the Giraffe

In the northeastern portion of the Belgian Congo lives the okapi, a near relative of the giraffe. This animal was unknown to civilized man until 1900, when Sir Harry H. Johnston, the English naturalist and explorer, learned of its existence from Congo pigmies and obtained an imperfect skin and two skulls. So elusive is this creature and so perfectly camouflaged that specimens of it are exceedingly rare. The purplish-red color of the okapi's body, with its striped black and white forelimbs and hindquarters, blends admirably with the vegetation.

The full-grown okapi is much shorter than the giraffe, measuring less than five feet from the shoulders to the ground. It has a short, stout neck and a deer-like head. The male has horns shaped like those of the giraffe. These animals feed on roots, stems, and leaves, pulling in the food with their long tongues. Their thick, tough skins enable them to pass unharmed through the jungle undergrowth.

The okapi and the giraffe are the only members of the family *Giraffidae*, and are ruminant (cud-chewing) animals. They belong to the even-toed ungulates (order *Artiodactyla*). Zoölogists classify them between the deer and the antelope. Scientific name of the giraffe, *Giraffa camelopardalis;* of the okapi, *Okapia johnstoni.*

SCOUTING *with* GIRLS *of* MANY LANDS

GIRL SCOUTS When Lord Robert Baden Powell organized the first Boy Scout troop in 1908 he had no idea that he was preparing the way for a world wide program of scouting—a program in which girls as well as boys would take part (*see* Boy Scouts) But when in 1910 he called the Boy Scouts to meet him in London he was faced by a small but determined group of girls who had accompanied their Scout brothers to the meeting These girls insisted that they wanted to be scouts too so that they as well as their brothers could enjoy the scouting program of work and play

With the aid of his sister Miss Agnes Baden Powell he met the girls demand by organizing the Girl Guides The organization has since spread to many other countries and more than a million and a half girls are benefiting by the persistence of that little group of English girls who made themselves a place in the scouting program although they had not been invited! All the Girl Scouts and Girl Guides of the world follow substantially the same promise and laws A Girl Scout's uniform is a passport of friendship in almost any country she may visit



These four Intermediate Girl Scouts are combining two favorite act vities at camping and craftwork They are using long pine needles in making their baskets

Mrs Juliette Low a friend of Lord Baden Powell carried the idea of Girl Guiding (or Girl Scouting as it soon was called) to the United States and organized the first Girl Scout troop in her home in Savannah Ga March 12 1912 Until her death in 1927 Mrs Low gave generously of her time money and enthusiasm first to develop Girl Scouting in the United States and later to make it known elsewhere A book, Juliette Low and the Girl Scouts tells her story

In 1950 Congress passed a law incorporating the Girl Scouts as the Girl Scouts of the United States of America and setting up a National Council of Girl Scouts This law requires the corporation to make an annual report to Congress

Thousands of women have found new friends and interests as leaders of Girl Scout groups The organization offers special training courses for leaders

The Girl Scout program is based on the things girls are most interested in and gives them an opportunity to learn much that they need to know if they are to live happy useful lives It covers such general fields as health and the outdoors homemaking community service and special interests such as writing arts and crafts or other hobbies A Girl Scout knows how to combine real fun with worthwhile activities

BROWNIES LEARN TO COOK



The Brownies in this picture are making *Girl Scout cookies* using a special cutter to give a trefoil shape

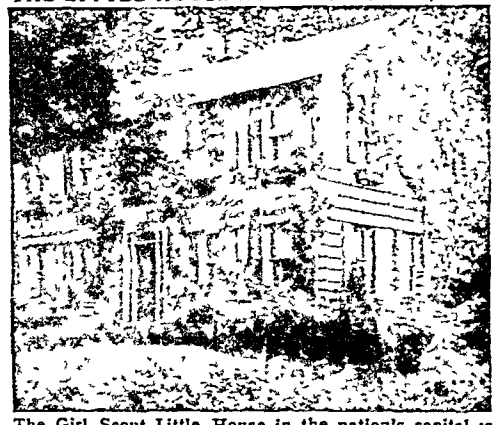
Girl Scouting activities are planned to meet the needs and interests of three age groups girls from 7 through 9 (Brownie Scouts) girls from 10 through 13 (Intermediate Scouts) and girls 14 through 17, or in high school (Senior Scouts)

The Brownies are organized in groups, each containing from six to sixteen girls. They go to camp just as their older sisters do They make friends with the animals in the camp and watch the behavior of the turtles and the frogs and other water life They learn to be helpful picking up their toys and helping to set the table at home They make up their own songs and stories

and dramatize them at the camp fire. When Brownies are 10, they "fly up" to become Intermediate Scouts.

The Intermediate Scout learns the Girl Scout promise and laws and understands that she must make them a part of her life. She makes herself useful by packing Christmas baskets to be distributed by welfare organizations or by bringing gifts and a bit of cheerful song to shut-ins and old people. Many Girl Scout troops raise money to help flood sufferers and other victims of disaster. The Girl Scout goes camping and hiking. She knows trail signs to guide her in the woods and she learns to make herself comfortable with a minimum of equipment She learns what food she should eat and how much rest she should have to keep herself healthy. She learns to carry herself well. She earns or saves money for a woods-green uniform.

THE LITTLE HOUSE AT WASHINGTON, D.C.



The Girl Scout Little House in the nation's capital is modeled after the boyhood home of John Howard Payne at East Hampton, L.I., which inspired his famous song, 'Home, Sweet Home'. Girl Scouts use it for meetings and varied activities

The Senior Girl Scout, 14 years old or more, may continue with many of the activities of the younger Scouts, adapted to her own age level, but she may also follow up the more specialized interests that girls of her age often have. She may already be thinking about a position and she probably wants to discover how she may take her part in a wider social life with poise and graciousness. Her Scout troop helps her to face the changing conditions of modern life by awakening her to the problems of citizenship, and by offering her opportunities to develop leisure-time hobbies and to learn the requirements of some of the kinds of work open to women.

Intermediate Girl Scouts can win proficiency badges in 11 fields of interest: agriculture, arts and crafts, community life, health and safety, homemaking, international friendship, literature and dramatics, music and dancing, nature, out-of-doors, and sports and games. The badges are of four classes: Tenderfoot, Second Class, First Class, and Curved Bar. Senior Girl Scouts have an additional field, vocational exploration.

A HAPPY EVENING AT CAMP



After a busy day outdoors, Girl Scouts like to gather around the fire for an evening of reading or storytelling.

All Girl Scouts are members of an international organization, "The World Association of Girl Guides and Girl Scouts." Through the international letter box, Girl Scouts in the United States correspond with groups in other countries. By thus learning about their sister Scouts they promote international good will.

Each year, except when war makes it impossible, some Girl Scouts from the United States are sent to "Our Chalet," the permanent international meeting place of the Girl Scouts at Adelboden, Switzerland. There they make friends with Guides and Scouts from other countries and lay the basis for future international understanding. "Our Chalet" is a gift of Mrs James J. Storrow of Boston, the annual meetings there are financed by the Juliette Low Memorial Fund, set up in memory of the founder of Girl Scouting in the United States.

Girl Scout troops are usually divided into patrols of from four to eight girls. These patrols plan special activities and elect a patrol leader who meets with the other patrol leaders, the troop scribe, the troop treasurer, and the troop captain and her lieutenant to plan the program of the troop as a whole. The troops generally meet once a week.

During the summer many girls go to one of the numerous Girl Scout camps that are scattered through the country. It is hoped that ultimately every Scout will have at least two weeks each year in camp.

There are more than a million Girl Scouts in the United States. Each Scout pays a dollar a year as national dues. Information about the Girl Scout program and activities is contained in the 'Leader's Guide to the Brownie Scout Program', 'Girl Scout Handbook', 'Senior Girl Scouting', and 'Leadership of Girl Scout Troops—Intermediate Program'. These books and a catalog of other Girl Scout publications may be obtained by writing to Girl Scouts of the United States of America, 155 East 44th Street, New York 17, New York.

The Girl Scout promise is this

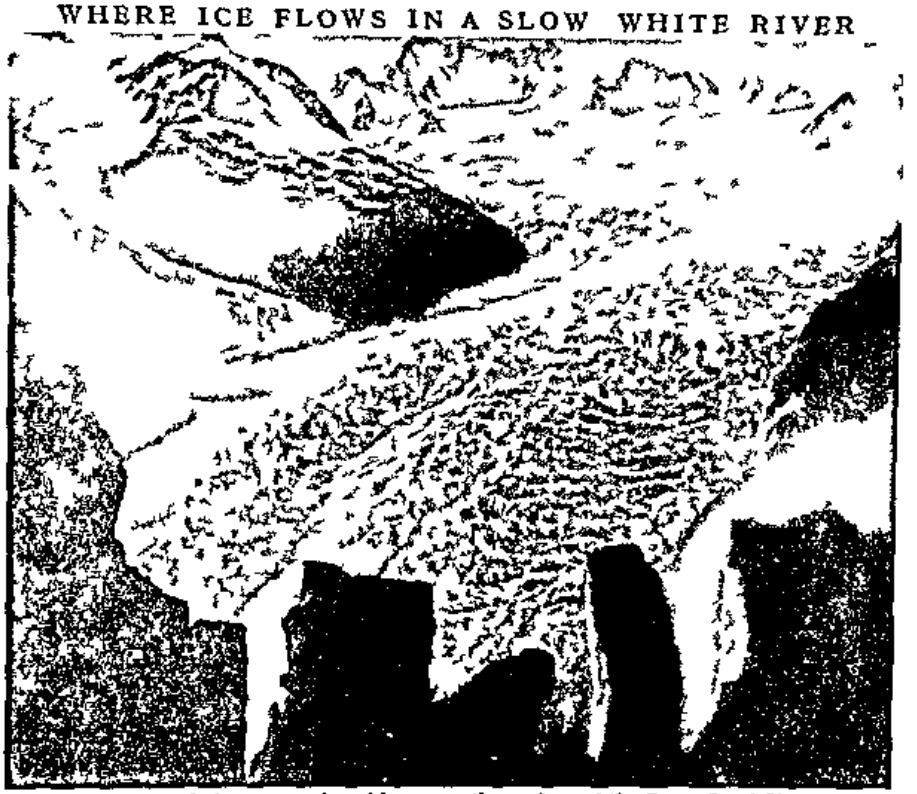
On my honor I will try
To do my duty to God and my Country
To help other people at all times
To obey the scout laws

The laws of the Girl Scouts are these

1 A Girl Scout s honor is to be trusted
2 A Girl Scout is loyal
3 A Girl Scout s duty is to be useful and to help others
4 A Girl Scout is a friend to all and sister to every other Girl Scout
5 A Girl Scout is courteous
6 A Girl Scout is a friend to animals
7 A Girl Scout obeys orders
8 A Girl Scout is cheerful
9 A Girl Scout is thrifty
10 A Girl Scout is clean in thought word and deed

The Girl Scouts motto is 'Be prepared Their slogan is Do a good turn daily Their pin is a trefoil with the initials G S and the American eagle in low relief

WHERE ICE FLOWS IN A SLOW WHITE RIVER



Great crevasses and sharp p nnacles of ice cover the surface of the Franz Josef Glacier in the Sou hern Alps South Island New Zealand Such crevasses are of en produced when a glac er rounds a curve as th s one does In the foreground is Castle Rock

GLACIER Of all the sculptors tools at work carv ing and polishing the face of our earth perhaps the strangest and most awe-inspiring is the glacier a great river or sea of ice pouring invisibly down a mountain side carrying huge boulders breaking off hillsides building up walls and mo inds of stone more grandly than ever an Egyptian king built up the pyramids But they work slowly impercept bly over the long years They look as still and motionless as the rocks they move How do they work? What starts them on their age-long tasks?

In many of the world s high mountains the heat of summer is not sufficient to melt all the snow which falls in winter And wherever th s occurs year after year the amount which accumulates in the upper ends of mountain valleys comes to be very great These areas where the snow lasts from year to year are known as snow fields In the sunny days of summer the surface snow of a snow field melts and the water sinking into the snow freezes beneath the surface just as it does in the last snow banks of spring and helps to change the snow to ice The we ght of the snow above also compacts the snow below By the melting and refreezing of the water and by pressure the larger part of the snow of a snow field is changed into ice Just below the snow at the top the ice is not very compact but farther below the surface it is solid A snow field is therefore really an ice-field only covered with snow

When the snow and ice become sufficiently deep the ice beg ns to creep down the slope Ice which has this slow creeping movement down a mountain valley from a snow field above is a valley glacier ' As it moves with tremendous force it carries along masses of rock and these act as cutting tools With these tools and the ice itself the glacier deepens the orig inal valley floor sheers off and widens its sides The valley which remains after the glacier has retreated is U-shaped whereas a stream-cut valley is V-shaped A typical glac er-carved valley is the beautiful Yosem ite (*see* Yosemite National Park)

Washington has more glaciers than any other state In western Montana an area has been set aside as Glacier Nat onal Park (*see* Glac er Nat onal Park) In western Canada Alaska the Andes the Alps and otl er high mountains there are also many valley glaciers

There is another great type of glac er which is not a valley glacier When the snow and ice accumulate in quant ty on a plain or a plateau it moves out from the center in all directions This sort of a glacier is an ice cap If it is very large it is a continental glacier About four fifths of all the surface of Greenland is covered with such an ice cap and the area of accumulated ice discovered by explorers around the South Pole in Antarctica is still larger

Glaciers move at the rate of a few inches or a few

feet a day. There are perhaps glaciers which move as much as 100 feet a day, but few of them move more than three or four feet. During the movement, the ice is cracked, especially where the ground over which it passes is rough. Thus arise the big cracks or "crevasses" which make travel across glaciers difficult and dangerous.

As the ice moves it gathers up great masses of earth and stones. This debris, carried either on top of the glacier, or frozen within or underneath it, eventually forms belts or ridges known as "moraines" which are sometimes 25 to 100 feet high. A rounded, elongated moraine whose longer axis points in the direction of ice movement is called a "drumlin." The unassorted, jumbled mixture forming the moraines and drumlins is known as "glacial till" or "boulder clay," while the general term "glacial drift" includes all material which may be deposited by glaciers, regardless of its form or nature.

The huge ice cap, which formerly covered about 4,000,000 square miles of the northern half of North America, produced great topographical changes by eroding the surface of the land and by depositing drift. This production of surface changes by glacial action is called "glaciation," and a country which exhibits them is said to be "glaciated." (*See* Ice Age.)

GLACIER NATIONAL PARK. "The Alps — right here in the United States!" This is the first cry of the visitor to that mountain wonderland in northern Montana where 60 living glaciers wind in and out among chains of unscaled crags glistening with ice and snow; a place where waterfalls tumble down dizzy precipices, edged by primeval forests; where 250 lakes lie cradled among giant peaks, and where enchanted streams wander through wildflower gardens.

This public park has been called "the roof of North America," for from its mountain heights the waters divide and flow into the Gulf of Mexico, into Hudson Bay, and into the Pacific Ocean. It was once a favorite haunt of the Blackfeet Indians, but when copper was discovered there in 1890 the white man found his way to this home of the mountain sheep, and in 1896 Congress bought it from the Indians. But the copper deposits were not large enough to pay for mining them, and so the region was turned into a national park in 1910. Today the wilderness of about 1,560 square miles is dotted with camps, cabins. and modern hotels. In 1932 Glacier Park and the adjoining Waterton Lakes National Park in Canada were combined to form the Waterton-Glacier International Peace Park. (For illustration in color, *see* National Parks.)

GLADIATOR. "We who are about to die salute you!" Such was the cry with which the gladiators or professional fighters of the Roman arena saluted the Emperor as they marched about the amphitheater before engaging in combat with one another, or with wild beasts, for the entertainment of the populace. For the most part they were prisoners taken in war, slaves, or the worst classes of criminals. When a gladiator was disabled or disarmed, if the spectators turned up their thumbs the vanquished man was to be spared, but if they turned them down he was to be slain. The successful fighter was at first rewarded with a palm branch, but in later years it became the custom to add to this rich and valuable presents and a prize of money.

The custom of giving gladiatorial shows seems to have been borrowed from the Etruscans, who sacrificed slaves and prisoners on the tombs of illustrious chieftains. The first combat in Roman history took place in 264 B.C., and the fashion rapidly spread. Julius Caesar gave a show at which 320 couples fought, and the Emperor Titus (79–81 A.D.) gave an exhibition of gladiators, wild beasts, and sea fights which lasted 100 days, in which 10,000 men fought. Such contests were finally stopped in 404 A.D., it is said, as a result of the splendid daring of Telemachus, an Asiatic monk, who rushing into the arena strove to part two gladiators. The spectators stoned him to death, but the Emperor Honorius issued an edict suppressing such exhibitions.

GLADIO'LUS. Stately in form and rich in color, the gladiolus is one of the most effective of garden flowers. There are more than 160 species of this lilylike member of the Iris family (*Iridaceae*). Most of them are natives of South Africa. From them gardeners have produced many hundreds of varieties of all colors. The flowers grow in spikes at the top of a stem sometimes four or five feet tall. They are tubular, with six or more divisions (petals and petallike sepals). The plants may be raised from seed or from the corms. The name gladiolus is the diminutive of the Latin *gladius*, a "sword," from the shape of the leaves. Sword lily is another name for the flower. In the United States, Florida leads in growing gladioli for northern winter markets.

GLADSTONE, WILLIAM EWART (1809–1898). On his graduation from Oxford in 1831 young William Gladstone wanted to become a clergyman in the Church of England. But his strong-willed father, Sir John, directed that he enter politics. For 60 years William Gladstone served the government almost continuously, achieving one of the most brilliant state careers in British history. Four times during the reign of Queen Victoria he was prime minister.

Gladstone was born in Liverpool, Dec. 29, 1809. His father was a wealthy merchant of Scottish descent, and had rich plantations in the West Indies. Young Gladstone went to Eton and Oxford. He enjoyed sports, but became noted as a student and debater. He was graduated from Oxford with first honors in classics and mathematics, a rare "double first."

At the age of 24 Gladstone entered the House of Commons as a Conservative. He was a striking speaker. His powerful yet musical voice commanded attention. Many of his speeches resounded with classical phrases, yet he had a gift for "swaying the masses."

Two relatively minor posts gave him invaluable experience. In 1835, he became undersecretary for the colonies. His tireless investigation of colonial problems convinced him that colonies should have local

THE LAST FIGHT OF THE GLADIATORS



It was in A.D 404 during the reign of the Emperor Honorius that th s thrilling event took place The gladiator with the trident and the net had just brought down his heavy armed antagonist and was about to deliver the death blow The crowd in the Colosseum watched breathlessly for the fatal thrust Suddenly the aged monk Telemachus leaped into the arena, and in the name of God cal ed upon the victor to stop Telemachus was stoned to death by the infuriated crowd but his brave sacrifice had its reward for the emperor forbade gladiatorial combats from that day on.

self-government. This strain of liberalism appeared increasingly in Gladstone's thinking. In 1841 he became vice-president of the Board of Trade.

Two years later, as president of the Board, he entered the Cabinet, where he fought for free trade. His financial knowledge enabled him in 1852 to reveal the flaws in the budget presented by Benjamin Disraeli, chancellor of the exchequer. The rivalry between these two men lasted for 30 years.

WILLIAM EWART GLADSTONE



Statesman, scholar, and orator, Gladstone was known as the "grand old man" of British politics.

In the sixties the more liberal Whigs—or Liberals, as they came to be called—received additions from the free-trade Conservatives (the followers of Robert Peel). Gladstone, originally a Conservative, was among those who moved toward Liberalism. The Liberals' power increased when the electorate was broadened in 1867 to include workingmen in towns. Gladstone soon obtained complete ascendancy in the party.

Gladstone helped to bring about most of the great social and political reforms of the late 19th century. He was responsible for the first state aid to public elementary schools, for opening Oxford and Cambridge universities to men of all religions, and for introducing the secret ballot. Most of all, he is remembered for his Irish reforms.

Ireland's age-old misery and discontent were best solved, Gladstone believed, by admitting and correcting the wrongs done by England. Although most of the people in Ireland were Catholics, they were forced to pay tithes to the established Protestant church of Ireland. Gladstone led in passing an act disestablishing the Irish Protestant Church in 1869. He was also responsible for the first Irish Land Act (1870), which protected landless farmers against eviction and helped them buy their farms from the absentee landlords. Finally, he introduced the first Irish Home Rule Bill. It was this bill (1886) that split the Liberal party. Gladstone was deserted by many Liberals. His bill was defeated, and he himself was forced to resign as prime minister. When he returned to that post a few years later, he brought in his second Home Rule Bill (1893). It was passed in the House of Commons this time but failed in the House of Lords. His effort was important, nevertheless, as a first step toward both Irish independence and the limitation of the Lords' veto power.

Gladstone explained his change from Tory to extreme Liberal thus: "I was brought up to distrust and dislike liberty: I learned to believe in it." In his 85th year (1894), approaching blindness forced him to retire from public life. He died at his home in Hawarden Castle, Wales, in 1898. He had served as prime minister from 1868 to 1874; from 1880 to 1885; from February to July, 1886; and from 1892 to 1894.

GLAND. In various parts of the body there are organs called glands. They take materials from the blood and lymph and use them to make special chemical compounds. The salivary glands, liver, and pancreas, as well as millions of tiny glands in the walls of the stomach and intestines, manufacture substances that take part in digestion (*see* Digestion; Liver). Lacrimal glands provide a salty liquid to keep the eyes clean and moist. Sweat glands supply the skin with moisture that cools the body as it evaporates. These glands all have outlets, or *ducts*. The glands' products pass through the ducts to the digestive tract or to the surface of the body. Glands of another kind have no outlets. Instead, blood collects their products through the walls of capillaries and carries them to other parts of the body. Such glands are called ductless or endocrine glands. Their products are hormones (*see* Hormones).

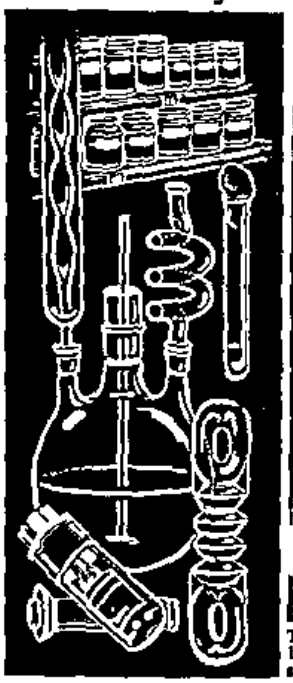
GLASGOW, SCOTLAND. Glasgow is the largest city in Scotland. It is the center of a great industrial area, and it is also Scotland's chief port in the west. It lies on both banks of the River Clyde, 21 miles inland from its estuary, the Firth of Clyde. Some of the biggest ships afloat have been built on this river.

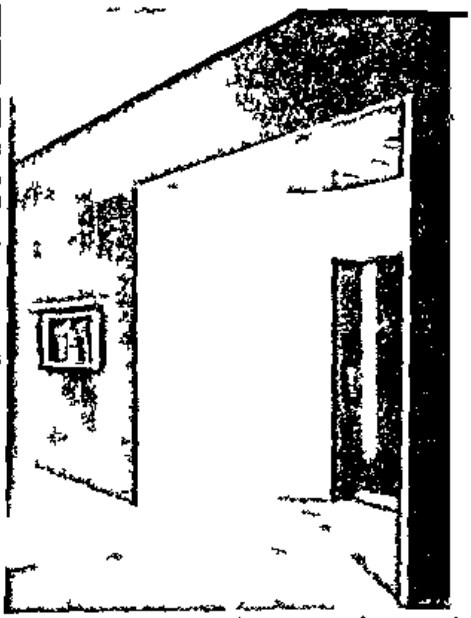
In the early 18th century the Clyde at Glasgow was only two feet deep at low tide. After Scotland's union with England, the people of Glasgow determined to have a port so that they could share in England's profitable trade with America. In 1773 they began to narrow the river channel, forcing the river to dig its bottom deeper. Dredging has continued to the present time. Today great ocean liners can go into the heart of the city.

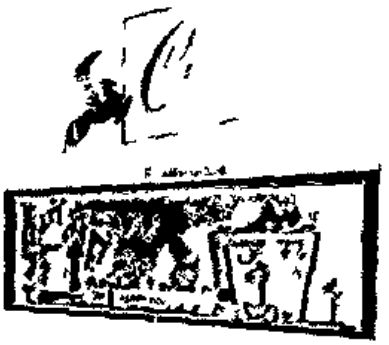
Glasgow's shipbuilding and other great engineering works were based on the coal and iron in the county (Lanarkshire). The iron ore is now exhausted, and the coal is also approaching an end. Glasgow's greatest days are probably past. The city now produces ships, locomotives, bridges, machinery, and textiles, and it is developing a wide variety of light industries. It also has a large tourist business because it is the starting point for trips to the western Highlands and some of the finest scenery in the British Isles.

Glasgow is a modern city with wide, straight streets and miles and miles of workers' houses. None of the buildings is of historic interest except the cathedral in early Gothic style, which was reconstructed in the 13th century. The University of Glasgow, founded in 1451, was rebuilt in the 19th century and all its buildings are modern. The municipal art gallery contains a fine collection of paintings. Population (1951 census, preliminary), 1,089,555.

GLASS *for* PRACTICAL *and* DECORATIVE USES







Th s modern store front shows how architects and designers make spectacular use of glass as surface blocks and t les as doors and showcase windows and as decorat ve tr m The d aw ng at the left suggests other important glass uses conta ners laboratory glassware and e ectrical and electron c parts

GLASS Our greatest benefit from glass is that it lets in light while shutting out air Glass windo vpanes admit daylight to our homes but keep out cold or stormy weatl er Glass bulbs transm t electric l ght but keep out air that would consume the hot filament Glass jars and bottles show us what is inside them Glass mirrors reflect light and optical glass in lenses focuses light for more accurate vis on

Glass serves in countless other ways In our homes we use glass cooking and tableware an l all sorts of glass ornaments Homes and industries use one kind of glass for thermal (heat and col l) insulat on and an other kind for electrical insulation Laboratories have glass beakers flasks acid containers and tubing Sev eral kinds of glass vacuum tubes are used in electronics Glass fibers are woven into many useful fabrics Foam glass made of countless tiny glass bubbles has many applications

Why Is Glass So Useful?

One reason for the widespread use of glass is that most glass products can be made cheaply The raw materials of glass—sand soda or potash and lime—are abundant and easily obtained Mass-production metho ls turn them into products such as bottles or bulbs at a very low cost for each unit Furthermore many different kinds of glass can be made to suit par ticular purposes An l molten glass is easily worked It can be rolled molded blown or drawn into countless s zes and shapes

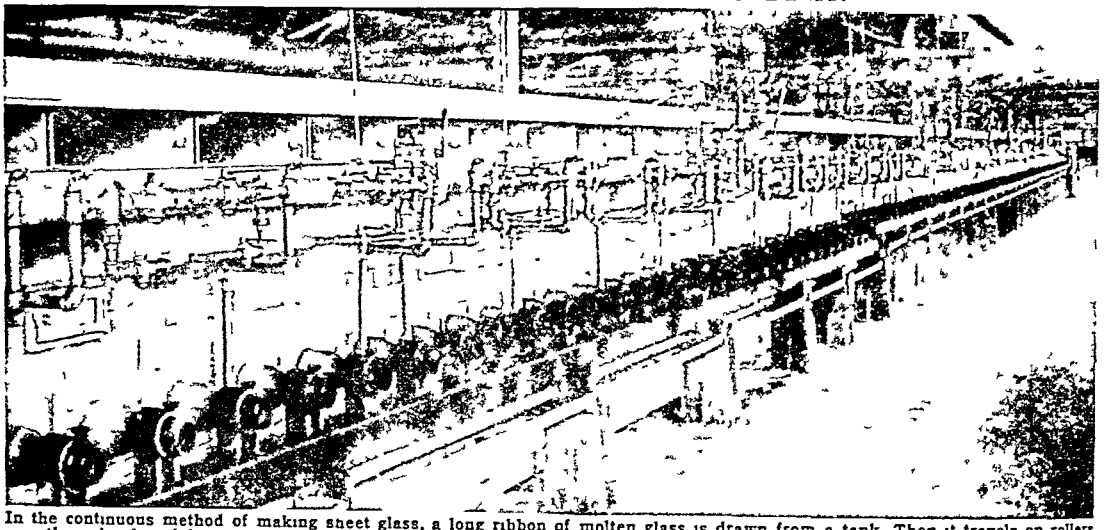
Glass is extremely d ir able Window glass can withstand weather for centuries Glass does not retain odors and can be completely sterilized It is nonporous and a sealed bulb or bottle can be made a rtight Acids (except hydrofluoric acid) do not affect most kinds of glass Therefore glass is widely used to hold acids and as a pot or liner to hold chemicals in reactions

GLASS FIBERS FOR FABRICS AND INSULATION



Glass can be drawn out into long sh immering fibe s of great strength The fibers are woven into fabrics such as the curtains in the picture at the left The material is fi eproof and shrinkproof After being washed it needs no ironing Right wo kmen are laying roof deck insulation made of glass fibers The material insulates against heat and cold and is extremely durable

COOLING HOT GLASS IN THE LEHR



In the continuous method of making sheet glass, a long ribbon of molten glass is drawn from a tank. Then it travels on rollers through a long lehr, or annealing oven, shown in this picture The lehr cools the glass slowly and thereby reduces strain.

Window glass and most glass bottles are brittle and easily broken, but certain glasses have amazing strength. Glass brick and glass tile support heavy loads in buildings Tempered plate glass is used for store counters, table tops, and doors Heat-tempered glass does not melt under high temperatures and withstands the shock of sudden cooling Safety glass splinters under a heavy blow, but does not scatter as dangerous fragments A glass fiber is stronger than silk of equal thickness.

Good glass has an almost gemlike brilliance, and in the hands of an expert craftsman it can take graceful and beautiful shapes. Antique glassware is highly prized, but many products of modern workmanship can equal or surpass it in beauty. Leading artists now make designs for glass tableware and for decorative bowls, vases, and plates.

Ingredients from the Earth

The most important ingredient for glassmaking is silica, in the form of sand. Not all sand is suitable If the sand has more than a trace of iron, the iron will make the glass dark green in color. Even for ordinary window glass, sand must be over 99 per cent pure silica, perfectly white and not too fine. Most of the sand used in American glass manufacturing comes from deposits along New Jersey river banks and from sandstone or sand beds in Pennsylvania, West Virginia, Illinois, and Missouri.

Silica alone can melt and run together to form glass but extremely high temperatures are needed. The melting temperature can be reduced by adding an alkali such as soda ash (sodium carbonate) or potash (hydrated potassium chloride) Salt cake (sodium sulphate) is often added to prevent an undissolved floating scum of silica.

Glass made of silica and soda ash or potash alone is called *water glass* It dissolves in water, and the solution can be used as a fireproofing or preserving agent or as a glue. But glass for most purposes must be rigid and durable Adding a *stabilizing* ingredient to the mixture or *batch* makes the glass hard and long-wearing.

MELTING SPECIAL GLASS IN POTS



For making glass of special types and thicknesses, the raw materials are melted in large clay pots. Here a workman uses a pincerlike crane to withdraw a pot from the gas-fired pot furnace From the furnace the molten glass will be carried to casting tables or molds

Lime in the form of limestone (calcium carbonate) or burnt lime is most often used Other stabilizing ingredients for the batch may be magnesium barium zinc aluminum lead or boron compounds

The whole melting process is helped by adding a large quantity of scrap or broken glass crushed to a fine powder called *cullet* From 25 to 75 per cent of the whole mixture may be cullet Glassmakers ordinarily use only cullet of glass they have made to be sure that they know all the ingredients in it

Other chemicals aid the melting process or remove impurities which might discolor the glass When a color is desired various metallic compounds may be added Cupric (copper) oxide or cobalt oxide gives a blue glass Green is obtained from chromium or iron compounds Red comes from selenium cuprous oxide or gold

Mixing and Melting the Batch

The separate ingredients for a batch of glass are thoroughly mixed in rotating devices that resemble cement mixers Then the batch is carried to the furnace for melting

Two types of furnaces are used the *pot* furnace and the *tank* furnace In the pot furnace the batch is poured into separate clay pots One furnace may hold up to 20 pots The pots are usually of one ton capacity and may be open or covered

The *furnace itself* is heated by oil or natural gas and the furnace interior may reach a temperature of more than 3 000° F These high temperatures are achieved by preheating the air used in burning the gas or oil Heat for this process comes from the spent flame gases which have already done their work in heating the *furnace* The walls of the tank furnace actually serve as a *container* for the melt These are lined with special fire-clay bricks which resist the heat of the molten glass

DRAWING GLASS BY THE FOURCAULT PROCESS



Here molten glass is drawn up from the tank through a *debiteuse* or drawing block One set of rollers with the gradually cooling glass A second fixed set of rollers with the drawing sheet and helps smooth it At the break off floor men cut the sheet into desired lengths

In the tank furnace the flame comes in direct contact with the glass Small glass factories use a *daily* tank which melts a few tons of glass ready for working the next day Larger factories use a *continuous* tank Raw materials constantly flow in at one end and molten glass is withdrawn at the other

Making Sheet and Plate Glass

One of the main uses of the continuous tank is to provide molten glass for making long sheets These are later cut to size for windows and similar uses

In the Colburn process, manufacture begins when a worker dips a tool, called a *bait*, into the tank. As he lifts the bait, molten glass rises with it, clinging like a sheet of hot taffy. He leads the sheet across bending rolls and starts it on its way. Thereafter the sheet is drawn ribbonlike from the tank by rollers. It passes between flattening rolls and through an *annealing lehr*, or oven. In the lehr, the glass is slowly cooled, or annealed, under controlled temperatures. The cooling removes internal stresses from the glass structure.

In the Fourcault process, shown in the picture on the previous page, a *debiteuse* or clay block floats on the surface of the molten glass. A workman starts the glass rising through a slot in the debiteuse with a bait, and it continues up through flattening rolls. Controlled temperatures anneal the glass as it rises. At the breakoff floor, workmen called *breakers* cut the glass to desired sizes.

Plate glass is usually thicker than window glass and offers less distortion to vision. Some of it is still made by the old table-casting process. Here molten glass is poured from a pot onto an iron casting table, rolled into uniform thickness, then carried to an annealing oven.

The *continuous-pour* process for making plate glass somewhat resembles sheet-glass manufacturing methods. Molten glass pours over a lip at the edge of the tank and then passes as a shallow stream through rollers. It continues directly through the annealing lehr.

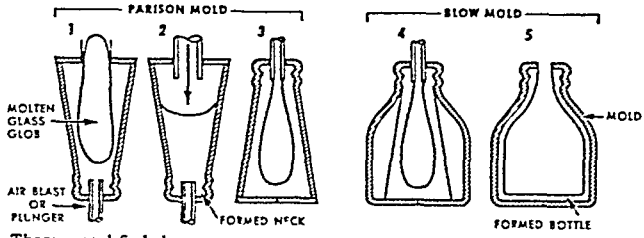
Plate glass made either by casting or pouring must be ground and polished. When the plate is cooled, it is set in plaster of Paris, then ground by giant disks using sand, emery, and water as an abrasive. This process removes the larger surface flaws and brings the glass down to the desired thickness. Then felt-surfaced polishing disks apply a high gloss to the plate with jeweler's rouge (iron oxide) and water.

Sometimes the glass is not polished but given a separate surface treatment that makes it translucent (that is, it transmits light) but not transparent (nothing can be seen through it). (Why glass has varying properties such as different degrees of transparency is not yet known. Glassmakers still achieve many desired results by using methods which experience has proved will work.)

Tempered plate glass is given special heat treatment that makes it several times as strong as ordinary plate glass. It is immune to sudden heating and cooling. *Safety glass* is made by combining two pieces of plate or sheet glass with a layer of transparent plastic between them. When the glass is broken by a blow, the plastic keeps the fragments from scattering.

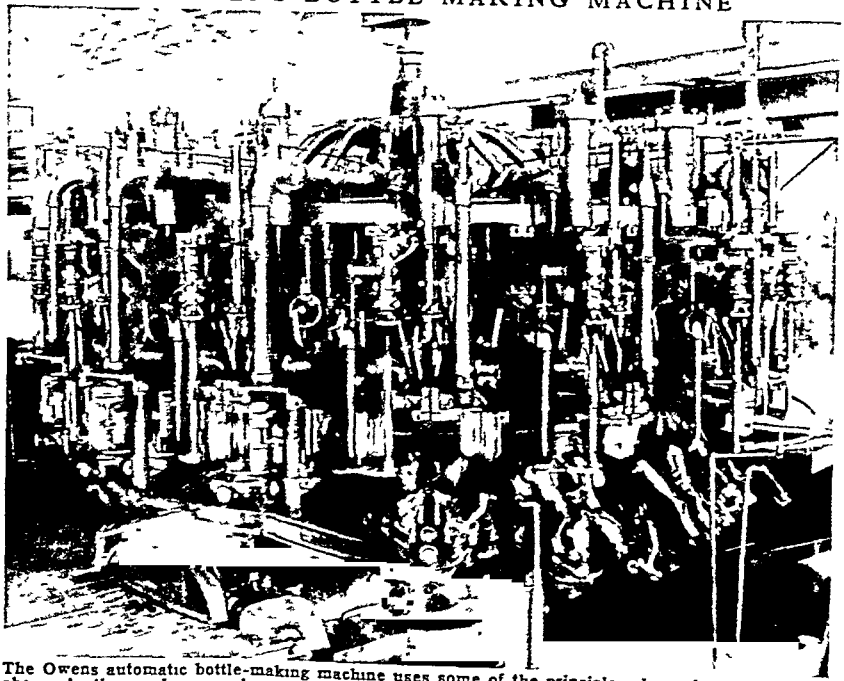
For large windows manufacturers use two panes, set a fraction of an inch apart. They seal all edges, creating a dead-air space between the panes. This forms an excellent insulation,

HOW AUTOMATIC BOTTLE MACHINES WORK



These simplified drawings summarize different methods of making glass bottles. 1. A glob of molten glass drops into the preparatory (*parison*) mold. 2. The glob is pressed toward the bottom, forming the neck. 3. The mold is inverted, and an air blast or plunger forces the hot glass to fill all sides of the mold. 4. The partially formed bottle is transferred to the final (*blow*) mold. 5. Another air blast forces the glass against the sides of the mold, giving the bottle its final shape.

THE OWENS BOTTLE-MAKING MACHINE



The Owens automatic bottle-making machine uses some of the principles shown in the drawings above. As the machine revolves, each mold mechanism passes the tank and sucks up a glob of molten glass to begin work. The machine produces hundreds of bottles a minute.

and the inner pane does not frost over in cold weather Glass from pots or tanks is also cast or molded into *architectural* glass with deep surface patterns and hollow air tight *building blocks*

Optical Glass

Optical glass for spectacles microscopes telescopes and other specialized uses is prepared more carefully than any other glass There are two general types *Crown glass* has low refraction and low dispersion *Flint glass* has high refraction and high dispersion (Explanations of the terms refraction and dispersion are given in the article on Lens) Each type has varieties made from hundreds of different batch compositions

For high-quality lenses the batch is melted in clay pots and allowed to cool In cooling the glass breaks up into rough fragments These are inspected for defects Selected pieces are reheated to softening temperatures and shaped into lens blanks by hand tools or in a mold Glass for lower-quality lenses is poured from the pot onto a casting table then rolled flat After annealing the sheet is cut up into blanks

Pouring glass for the 200 inch reflector of Mount Palomar Observatory in 1934 was one of the most painstaking tasks in glassmaking history At the bottom of the mold were ceramic blocks to form pockets and ribs in the glass These reduced weight and made places for attaching fastening devices On the first pouring some of the blocks came loose and rose to the surface spoiling the operation The second pouring was successful The 20 ton casting was allowed to cool only a degree or two a day for ten months Grinding and polishing proceeded with equal care (*See also* Observatory)

Molding and Blowing by Machine

Manufacturing glass bottles jars tumblers and similar items employs highly involved mechanical processes But the methods can be understood generally by studying the diagram on the previous page Notice that the *parison* mold receives molten glass and starts the shaping process especially the neck and the *blow* mold gives the glass its final form

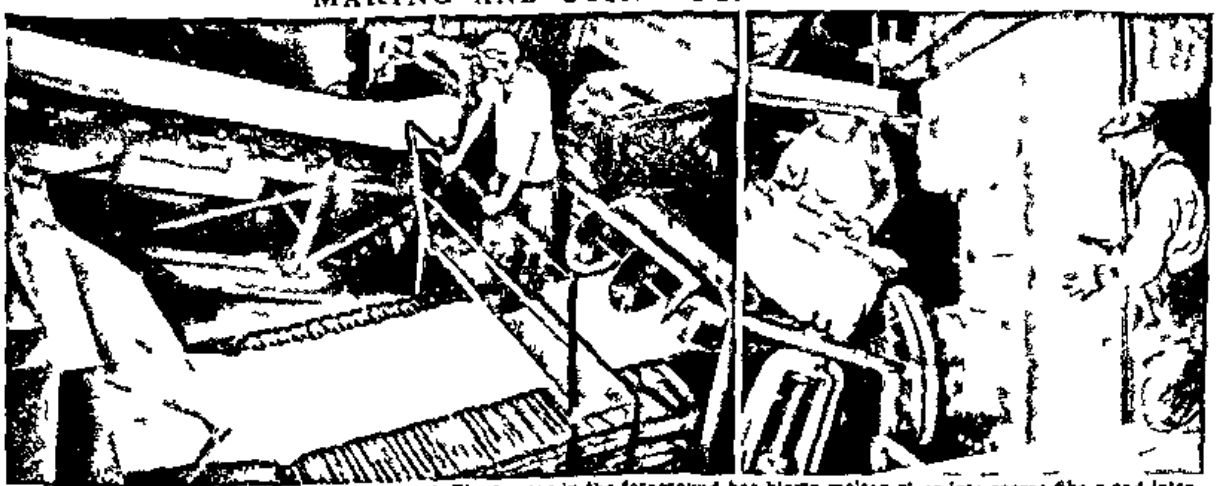
The main difference between various bottle-making machines is the method by which the glass enters the mold In the *suction-feed* type the parison molds suck up the glass from a shallow tank In the *gob feeder* glass flows from the tank into a trough At the lower end of the trough is an orifice The glass drops through the orifice and mechanical shears cut

FROM MOLTEN GLASS TO FABRIC YARNS



At the left the girl worker is drawing hundreds of glass fibers into a continuous filament textile strand At the right cones of glass fiber yarn are being unreeled and wound on a warp beam to prepare for weaving a glass fabric

MAKING AND USING GLASS WOOL



The machinery at the left is making glass wool The hopper in the foreground has blown molten glass into coarse fibers and interlaced them as they emerge The stream in the background has been puffed up to woolly resiliency At the right workmen apply a blanket of glass wool as insulation for petroleum refinery machinery Metal mesh holds the glass wool in place

off the exact quantity needed to fill the parison.

In making electric light bulbs, a ribbon of hot glass leaves the tank and flows between rollers. One roller has a circular depression that leaves its mark at regular intervals along the ribbon. The ribbon moves to a flat conveyer belt with holes into which the depressed portions of the ribbon fit. Molds rise around the depressions and compressed air nozzles drop down over them. The nozzles puff the depressions into partial shape; and a second set of nozzles and molds finish the operation. After annealing, the inside of the bulbs are frosted by spraying with a solution containing hydrofluoric acid.

Bottle and bulb machines work tremendously fast, producing many hundred units a minute. Other molded ware is produced more slowly. Another important product of molding processes is *borosilicate* glassware, made from a mixture of about 80 per cent silica, about 10 per cent boric oxide, and some alumina. The glass is extremely heat resistant and finds wide use for cooking utensils and laboratory glassware. One of its trade names is Pyrex.

Glass Fibers and Foam Glass

A great variety of products is fashioned from fibers made of glass. The fiber itself may be only one fifteenth the diameter of a human hair, but it is actually a solid rod of glass. As such it has the qualities of glass. It does not burn or absorb moisture; it resists weathering, acids, and corrosion; and it is a good electrical insulator.

Glass for fibers is first formed into glass marbles. These are inspected for flaws, then remelted in a furnace. One method makes a staple fiber out of the molten glass. The glass flows through tiny orifices, and as it emerges jets of air or steam whip it into six- to twelve-inch lengths. Another method makes a continuous filament by pushing the glass through orifices, then twisting the fibers into a strand as they come out of the holes.

BLOWING GLASS IN A HOT MOLD



These pictures show steps in blowing a large blueprint cylinder. The *gaffer* (top) blows the molten glass into preliminary shape. Then the bubble is enclosed in a red-hot iron mold. Further blowing brings it to final shape. The mold opens and the cylinder is removed for annealing

The long-staple fibers look like cotton or mohair; the filaments resemble silk or rayon. After being coated, or bonded, with a starchlike compound, they can be handled by standard textile machinery (*see* Fabrics; Textiles). Coarser fibers are interlaced to form *glass wool*, or are matted down and held together with a plastic for use as a mat or straining filter.

Foam glass is made by heating a mixture of ground glass and finely divided carbon in a mold The mixture rises like a cake and fills the mold. When cooled and taken from the mold, the "cake" is a mass of sealed glass bubbles, rigid but extremely light and buoyant. It thus resembles cork in many ways, and is even better than cork for a variety of uses. It goes into life preservers and rafts and is used for thermal insulation in refrigerators, building walls, and roofs.

Working Glass by Hand

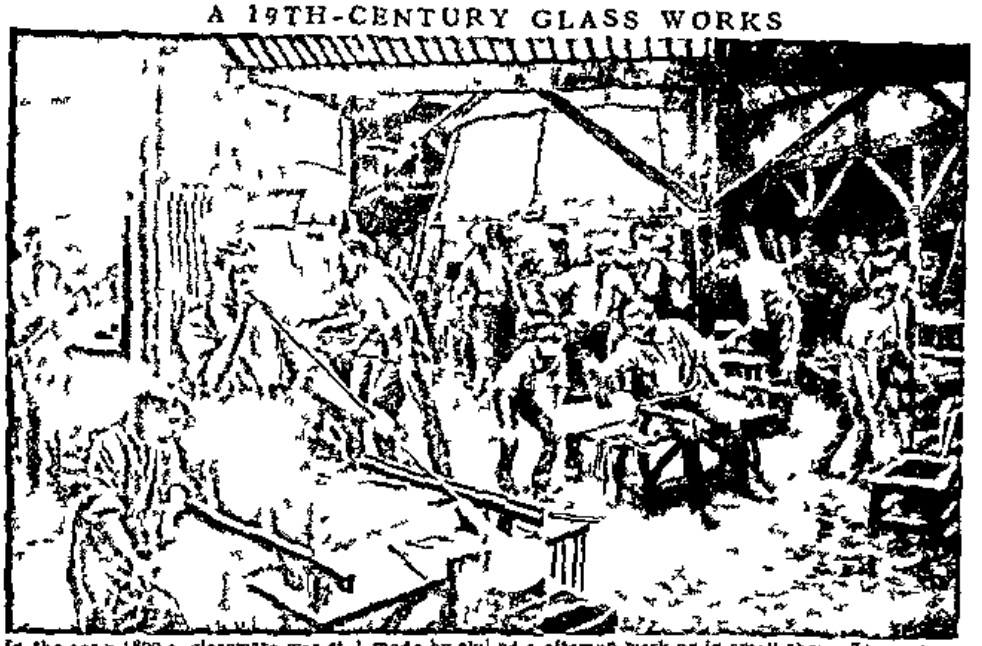
Automatic glass machines turn out many useful and even beautiful products. But machines can make only items of fairly simple design. These must be in wide demand in order to justify the cost of expensive equipment. To make products of intricate design or for special or limited use, craftsmen employ tools and methods that have changed little in centuries.

Blowing glass by the *offhand* method, without using molds of any kind, is a very old art. The process begins as a workman, called a *gatherer*, dips a blowpipe into glass somewhat cooler than the highest temperature reached in melting. The blowpipe is four or five feet long with a mouthpiece at one end and a gathering head at the other. The gatherer pulls up a mass of hot glass called a *gather*, and turns the pipe until the gather becomes globular. Sometimes he rolls the

gather on a *marver* (an iron slab) or on a hollowed out wet wooden block Then he blows a small bubble into the glass and hands the pipe to the *blower* or *gaffer*

The blower completes the work He blows the inside of the piece into final shape and with a few simple tools fashions the outside form and puts on the stem handle or other additions If the glass cools too rapidly he reheats it at the *glory hole* a small furnace

A 19TH-CENTURY GLASS WORKS



In the early 1800 s glassware was still made by skilled craftsmen working in small shops The picture shows gaffers blowing and shaping the glass while young apprentices stand ready to assist In the background small furnaces keep pots of molten glass ready for working

Hand Shaping with Molds

For certain circular products such as good-quality tumblers the blower places the gather into a *paste mold* This mold is constructed of hinged halves and is lined with a gummy paste He wets the mold before using and the contact of hot glass with water forms a layer of steam that keeps the glass from sticking The blower puffs into the glass and the air inside the mold shapes the piece

For shapes other than circular the blower may use an *iron* or *hot* mold This is a hinged cast iron mold heated red hot before using Fine glass tableware is often made in hand operated *press molds* The gatherer uses a *punty* a long iron rod instead of a blowpipe to fill the mold The mold worker called the *presser* works a lever operated plunger that shapes the glass

ENGRAVING A FINE VASE



Skilled craftsmanship continues in modern times This man is engraving a picture of an early locomotive on a vase using a copper wheel as a tool

The Age Old History of Glassmaking

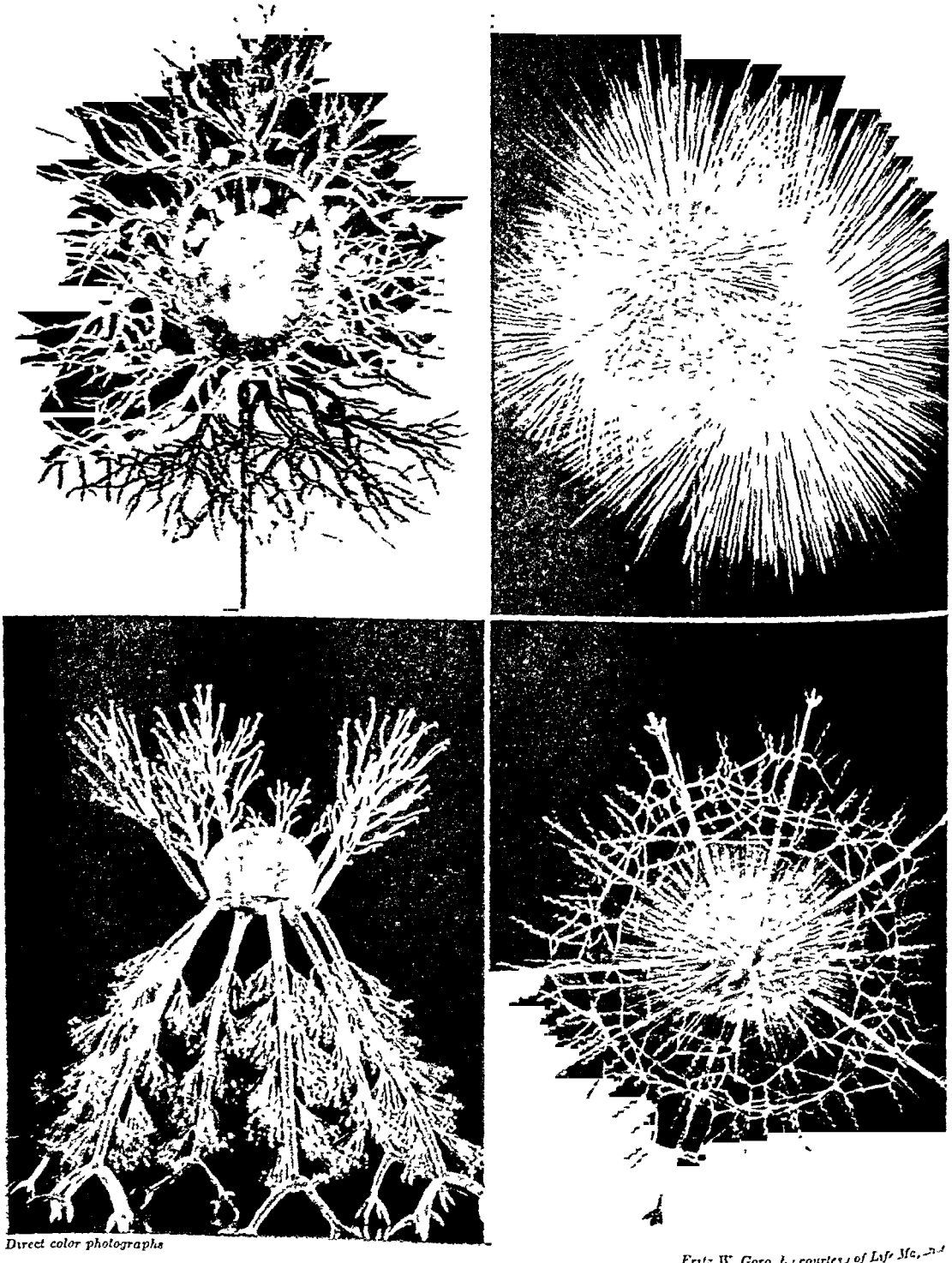
No one knows when or where men first made glass Pliny the Elder a Roman writer suggested that Phoenician sailors landed for the night on a sandy beach in Palestine and used blocks of *natron* a crude form of soda to make a temporary fireplace In the ashes next morning they found lumps of glass formed by the beach sand and the soda But modern research has traced glass far before the date Pliny set

Archeologists have found glass in Egypt that may have been made before 3400 B C The oldest definitely dated piece in an Oxford England, museum is a ball bead bearing the cartouche of Amenhotep I an Egyptian who reigned *from 1545 to 1525 B C* Glass beads found in excavations of the Third Dynasty of Ur (2150 B C) indicate that manufacture may have started in Mesopotamia or even *farther north*

The Phoenicians may have invented glass blowing and the Egyptians brought it to a fine art They also molded articles of great beauty They had *gorgeous mosaics of* glass and produced a glass color *Nile blue* which has remained unrivaled The Athenians decorated floors ceilings and sidewalks with colored opaque glass The Romans made the first window glass These were small panes a half-inch thick used in the luxurious Pompeian baths Spanish glass dates from the time of Christ with notable contributions in glass chandeliers and engraved glass

Venice s Contribution to the Art

Venice provided the link between the ancient and modern glassmaking arts Venetians knew glassmaking secrets from Roman times and in the early Renaissance were producing beautiful molded and spun glassware In 1268 the Venetian workers were incorporated and 23 years later they were segregated on the near by island of Murano partly because their furnaces were fire hazards but mainly to keep the secrets of the trade The death penalty was decreed for workers who left Murano



Direct color photographs

Fritz W. Goro, by courtesy of Life Magazine

GLASS MODELS OF SEA LIFE

The painstaking and delicate skill of the glass blower can be appreciated in these intricate models of radiolaria, minute one-celled animals that float near the surface of warm seas They were made by Herman Mueller for the American Museum of Natural History under the direction of Dr Roy Waldo Miner

Venetian glass was extremely light in weight, and when partially softened by heat, it could be fashioned into the most delicate pieces It had sparkling clarity unequaled until the 19th century Glass was one of Venice's chief exports, known throughout Europe and Asia Venetians also made fine glass mirrors

Stained Glass

The first mention of stained glass windows is in the writings of 4th- and 5th-century Latin and Greek authors By the 12th century pictorial designs had been introduced At first the glass was dyed during melting by adding metallic oxides Later, enamel was applied to the surface and fused on Etching toned down the enamel colors to delicate hues

GLASS OF SAINT LOUIS' TIME



The stained glass windows of the Chartres Cathedral in France are as precious as gems Most of them were gifts of King Louis IX This one shows St Eustace hunting The colors are brown and cream, in a border of red, blue, and green

Designs were made by fitting bits of the mosaic into strips of lead folded over the edges The strips also served to outline the design Medallions for the larger windows required by Gothic architecture were fitted into an iron framework which also enhanced the design But even ordinary windows were restricted to churches and castles for centuries, and from 1697 to 1851 Englishmen were taxed for all windows over six in their houses

Glassmaking in America

The first manufacturing in America was the glass plant at the short-lived Jamestown colony Thereafter colonial Americans made sporadic attempts to set up glassmaking industries but none was successful until Caspar Wistar, a Philadelphia brass-button manufacturer, entered the glass business in 1739 He brought in Belgian experts and shared the profits with them in return for glassmaking secrets Wistar concentrated on window glass and ware for everyday use

The first American to make fine glassware was Henry William Stiegel a colonial ironmaster of Manheim, Pa His craftsmen fashioned beautiful flint-glass tableware and ornaments in a variety of colors They executed delicate engravings, etchings, and enamelings to decorate the glass Stiegel's products are highly prized by collectors and museums The only colonial glass that rivals Stiegel's was made by John Henry Amelung.

Glassmaking Becomes a Giant Industry

In 1828 Deming Jarves patented an improved press mold, described in a previous section of this article The device made possible the mass production of many glass items Skilled craftsmen hoarding ancient secrets, were not needed, ordinary workers could handle the molds Jarves founded the Boston and Sandwich Glass Company and made fine products which are collector's items today

By the middle of the 19th century Pittsburgh was a center of glass manufacture because of near-by coal and sand deposits After the Civil War Edward Drummond Libbey and John B Ford pioneered in new industrial developments Ford was the first to use natural gas for tank furnaces In 1904 Michael J Owens invented bottle-making machinery and rose to great achievements in the glass industry

Until the 1900's all window glass was made by flattening hand-blown glass bubbles or, later, hand-blown cylinders In 1903 J H Lubbers invented a method of machine-blowing the cylinders using tons of glass made in tank furnaces About the same time Irving W Colburn began experiments with continuous-sheet methods His process began producing sheet glass in 1916, using Lubbers' tank-furnace techniques Émile Fourcault, a Belgian, made similar experiments and perfected the vertical sheet method, shown in the picture on a previous page His process was introduced in the United States in 1923

EXAMPLES OF MODERN ART GLASS





The work of modern artists in glass matches the most beautiful products of ancient times The exquisitely simple lotus vase at left was designed by George Thompson The bowl at the right was made by a Swedish artist Edward Hald The bowl is engraved by intaglio techniques into the inside surface This makes the figures appear as if in relief Intaglio engraving in glass is carried on by many craftsmen at Orrefors, Sweden

GOAT. No domestic animal has been of more use to man than the goat. It gives meat and milk. Fine leather is made from its hide. A strong cloth and soft wool are made from its hair. It is an amusing and affectionate pet, and in some places it is used as a *beast of burden.*

Goats are closely related to sheep. Like sheep, they are ruminants and eat grasses and shrubs (*see* Ruminants). They can live on coarse, thin growth, and people can raise them on land that is too poor to support cattle or sheep.

Goats are distinguished from sheep by the long beard on the chin of all males and most females. The tail is shorter than a sheep's and turns upward. The horns grow upward from the head, a sheep's horns twist to the sides of the head. Most goats are somewhat smaller than sheep. A full-grown domestic animal weighs 100 to 120 pounds. The hair is straight, but some kinds have a woolly undercoat.

The goat is often misunderstood and ridiculed. Its reputation for evil may come from the occasionally strong odor of the males. A clean animal has little odor except at the breeding season, and the females have none. Goats do not eat trash. If they are sufficiently hungry they may lick labels off tin cans to obtain the glue on the backs.

A LIVELY LITTLE KID



This playful and affectionate little goat of the Saanen milk breed makes a loveable pet. It is called a kid until it is a year old.

Breeders of goats prefer to call the males and females "bucks" and *"does," instead of the popular "billy"* and "nanny." The young is known as a "kid" until it is a year old. The domestic doe carries her unborn young for 21 to 22 weeks. One to three kids are born at a time. They can follow the mother about and even climb mountainsides a few hours after birth. They mature at six months, but domestic animals are not usually bred before 18 months. Goats may live to be about 15 years of age.

Wild goats are found only in Europe, northern Africa, and Asia. There are ten species, including the ibex (*see* Ibex). The Rocky Mountain goat of North America is not a goat but an antelope (*see* Antelope)

Domesticated goats (*Capra hircus*) are thought to be descended from the wild goat of Persia. Goats are often mentioned in the Bible and in the religious *writings of Buddha, Confucius, and Zoroaster.* Captain John Smith was among the first to introduce them into America.

Goats Raised for Milk

Goats cost little to feed in comparison with other domestic animals and require little space. Therefore they are often called "the poor man's cow." Different breeds are raised for milk, wool, and leather. The most popular milk breeds are the Toggenburg and Saanen from Switzerland, and the Nubian, from Egypt and Ethiopia. These are usually hornless, although horns occasionally occur.

The Toggenburg is brown or chocolate-colored, with a light stripe down each side of the face. The legs are light gray or white. The Saanen is pure white. The Nubian is black, dark brown, or tan, with or without white markings. It is larger than the Swiss breeds, with shorter, finer hair. It has long lop ears, and a prominent forehead and nose give it a peculiar "Roman" profile. It is not so hardy as the Swiss breeds and cannot stand severe cold.

Goats average four to six and a half pounds of milk a day for ten months of the year. *The milk differs* from cow's milk in the smaller size of the fat globules and in the softer curd. Thus it is easy to digest and therefore helpful for some infants and invalids. It is also free from tuberculosis germs. The cream is naturally homogenized; that is, it never separates thoroughly as it does in the case of cow's milk nor can it be skimmed off. It can, however, be separated mechanically.

If the milk is handled properly it has no unpleasant odor or flavor. Bucks should not be permitted to run

TWO USEFUL MEMBERS OF THE GOAT FAMILY



The Angora goat (left) has heavy fleece, which is made into the fabric called mohair. This goat lives in brush and desert country. Texas raises more than any other state. Notice the drooping ears and long, flat-twisted horns. At the right is a Toggenburg buck. This is a popular breed of milk goat. The buck has a brushy, upright tail and short pointed ears.

with the does because the milk may absorb their odor Butter and cheese can be made from goat s milk but the production in the United States is not large

Goats Raised for Wool

Angora and Cashmere goats are the chief wool producers The Angora goat native to Angora in Asia Minor, has a history that may be traced back to the days of Abraham This type has long spiral horns and an abundance of long white silky hair from which a strong cloth is made called mohair It is extensively bred in Turkey, South Africa and southwestern United States especially Texas which provides 95 per cent of the total clip The Willamette Valley in Oregon also has large herds Brushwood forms one of its favorite articles of diet and so herds of Angoras are much used for clearing brushland The flesh of this species is edible at all ages It is similar to mutton

Kashmir (India) and Tibet are the home of the Cashmere goat from whose beautifully soft silky undercoat are made the famous Cashmere shawls Attempts to introduce this breed in the United States have been unsuccessful Cashmere shawls are exceedingly costly for it takes the fleece of ten goats to make one shawl a yard and a half square The weaving is done by hand and takes about a year Especially beautiful patterns have been sold for as much as $1 500

The hides of kids and goats are used extensively for gloves and shoes, though much of the so called kid leather is an imitation, made from the skins of rats and dogs The skin of the Angora with the hair intact is often used for rugs and robes Goatskins are also used in the making of shoes morocco for book bindings and other articles Skins for manufacture into leather goods are imported chiefly from India, which usually provides from one third to almost half the total Nigeria the Union of South Africa, Ethiopia, Brazil and Argentina are also large sources

GOETHALS (*go'thals*) GENERAL GEORGE WASHINGTON (1858–1928) Building the Panama Canal was one of man s greatest victories over nature The man who led the construction of this mammoth project was Col (later Maj Gen) George Washington Goethals For seven years Goethals and his army of nearly 50 000 workers dug through mud sand and rock They built locks and railroads cut channels and lakes and at last succeeded in joining the Atlantic and Pacific oceans (*see* Panama Canal)

Goethals was born June 29 1858 in Brooklyn N Y As a youth he was big quiet and slow moving, less interested in play than in planning his future By working after school he put himself through three years of study at the College of the City of New York Then he heard of an open appointment to West Point He passed the examination and entered in 1876

He graduated in 1880 as a second lieutenant and chose to serve in the Corps of Engineers Four years later he married Effie Rodman, they had two sons Until 1907 Goethals combined practical field experience with terms of teaching at West Point and desk work in Washington, D C He built dams, bridges, levees, and locks on such important rivers as the Ohio, the Tennessee and the Cumberland Goethals became known both as an expert engineer and an inspiring leader of men

GEN G W GOETHALS



Goethals won world fame as builder of the Panama Canal.

When President Theodore Roosevelt appointed him to his great task Goethals was prepared He faced a job that two previous chief engineers had given up But by driving himself and his men the canal was completed a year ahead of schedule

Goethals divided his time between his office and places where actual digging and building were going on He toured the zone on a special motor-driven car that ran on railroad tracks, his men nicknamed it 'the brain wagon ' On Sunday mornings he held informal court sessions listening to complaints and settling disputes All workers no matter what their station could be sure of a fair hearing and verdict

The Panama Canal opened for traffic in 1914 Goethals remained in Panama as governor of the Canal Zone for two more years During the first World War he served as quartermaster general, then retired from the Army For the remainder of his life he acted as consulting engineer on important projects, including the Port of New York He died Jan 21, 1928

GOETHE (*gā'tē*), JOHANN WOLFGANG VON (1749–1832) In the ranks of German authors Goethe s name stands first His place is comparable to Shakespeare s in English literature Goethe's own character and personality is seen everywhere in his writings and the world finds Goethe the man even more fascinating than the people in his stories and poems

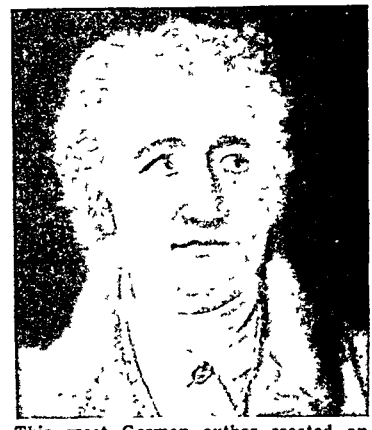
Goethe was born in Frankfort-on the-Main Germany on Aug 28 1749 His father Johann Kaspar Goethe was a lawyer and state councilor His mother Elisabeth was only 18 when Goethe was born She once said 'My Wolf and I were children together Goethe inherited his zest for life and his lively imagination from her From his methodical father he got steadiness of purpose These two strains of inherited traits helped him find the "golden mean ' in his life and in his writing

The boy grew up in a time of great political change The Seven Years' War (1756–63) established Prussian power and shook the whole of Europe It came close to the Goethes when the French judge advocate general was quartered in their house for a time But for the most part he had a happy childhood Kaspar Goethe and private tutors taught Wolfgang and his sister at home The boy was a good student of literature He wrote his first plays for a small puppet theater, a gift from his grandmother

When he was 16 he entered the University of Leipzig as a law student. He completed his studies at the University of Strasbourg and was awarded a doctor of laws degree in 1771. There the critic Herder introduced him to old German folk tales and to the best of English literature in German translation.

Goethe returned to Frankfort to practise law, but turned to writing almost at once. In 1773 his drama 'Goetz von Berlichingen' was published; the following year he wrote 'The Sorrows of Werther'. Both works were strongly influenced by the *Sturm und Drang* (Storm and Stress) literary movement that was sweeping Germany (*see* German Literature). 'Werther' made Goethe known throughout Europe.

GOETHE



This great German author created an enduring masterpiece in 'Faust'.

In 1775 Goethe met Karl August, Duke of Saxe-Weimar. The duke wanted a man to restore order in his state affairs. He knew young Goethe could install new and efficient methods. Goethe became his minister of state; and for the next 11 years the writer devoted himself to practical problems. He became expert in taxation, industrial problems, farming, and mining.

During this time, Goethe wrote little. He wanted to return to literature and asked the duke for a release. The duke refused; but Goethe left, nevertheless, for a two-year stay in Italy (1786–88). Goethe regarded his Italian journey as the most important period in his life. He realized the *Sturm und Drang* school had gone too far; and in the classic art and architecture of Italy he found the order and restraint that guided his work from then on. He became conservative but never reactionary.

Goethe returned to Weimar to live, but served the duke only as an adviser. Later he became the director of the duke's court theater. Because of Goethe, Weimar became the intellectual center of Germany. Many great men came to live in the little town. Among them was the poet and dramatist Schiller. He and Goethe became intimate friends and helped each other in their writings. Goethe's fame spread over Europe and to the United States. After meeting him, Napoleon exclaimed, "Voilà un homme!" (There is a man!)

Goethe had many romantic attachments, but he did not marry until he was 57. His wife was Christiane Vulpius, a girl he met in Rome. She remained apart from Goethe's intellectual life, but he loved her for both her companionship and her cooking.

Goethe's Greatest Work—'Faust'

Goethe once said that his poems made up a "great confession." In a sense the dramatic poem 'Faust' is a "confession" of his whole life. As a child, he learned the story from a puppet play; he wrote the last scene of his 'Faust' in old age. For most of his life he held the story in his mind, until at last it became an expression of his mature thought and philosophy.

The story is simple, but its implications are profound. In Goethe's version, Faust desires all knowledge. Unsatisfied with the results of his studies, he turns to magic. He conjures up the devil in the shape of Mephistopheles and makes an agreement with him. If he can gratify Faust's every wish, Faust's soul will belong to Mephistopheles. Faust learns that pleasures are not happiness. His wishes reach their highest point in a grand project that will benefit others. The moral height he has reached calls the powers of heaven to his aid. In response they wrest his soul from Mephistopheles' hold. (*See also* Faust Legends.)

'Faust' was completed in 1831. Goethe died at Weimar on March 22, 1832. His chief works, in addition to single pieces, were: 'Goetz von Berlichingen' (1773); 'Werthers Leiden' (Sorrows of Werther), 1774; 'Iphigenie auf Tauris' (1787); 'Egmont' (1788); 'Torquato Tasso' (1790); 'Reineke Fuchs' (Reynard the Fox), 1793; 'Wilhelm Meisters Lehrjahre' (Wilhelm Meister's Apprenticeship), 1796; 'Hermann und Dorothea' (1797); 'Aus meinem Leben: Dichtung und Wahrheit' (Out of My Life: Fiction and Truth, autobiography), 1811, 1812, 1814, 1833; 'Faust', complete (1831).

GOGH (*gōk*), **VINCENT VAN** (1853–1890). "You paint like a madman," van Gogh was told. His critics were only partly right. Van Gogh's later years were marked by attacks of insanity, and he ended his life by suicide. However, his work was not that of a madman but a genius. Today the world acclaims this tragic Dutch painter as one of the greatest artists of all time.

Vincent van Gogh was born March 30, 1853, in Zundert, in the Netherlands. His father was a clergyman, and Vincent was the eldest of six children. His closest friend was his brother Theo. Both attended school in a near-by village. When Vincent was 16 his uncle got him a job as clerk with a large firm of art dealers. In their branch at the Hague he became an efficient worker. After four years he was transferred to London. Here he visited art museums and read many books. But an unhappy love affair upset him greatly. He became silent and withdrawn and acted queerly.

Hoping the change might help, his employers sent him to their Paris branch. He continued his reading, especially in the Bible, and studied great paintings in the galleries. But his queer ways became more noticeable and he was dismissed. He worked for a year in an English school and in a Netherlands bookstore, then decided to become a minister.

In 1877 he began studying theology in an Amsterdam school. He was a poor scholar and he disagreed with his teachers on religious doctrines. He entered a missionary school in Brussels, then went out as a

field worker among the poor miners of the Borinage district in Belgium There he preached gave nursing care and sacrificed himself in every way But after two years his appointment was withdrawn and he was again cast loose

By 1880 van Gogh realized that his true vocation was art Theo *now earning a good salary* gave him an allowance and continued it for the rest of Vincent's life He began to draw and paint in earnest For five years he studied and worked in Brussels the Hague and Antwerp He spent several months with his family at Etten and Nuenen *In 1886* he went to live with Theo in Paris

Here he worked hard and met the leading artists But he grew increasingly nervous in Paris and *after two years he moved to Arles,* in the south of France He rented a little house and made a few friends among the towns people He invited the painter Paul Gauguin to stay with him But they quarreled and in *a fit of madness* Vincent cut off his own left ear Knowing now that

VINCENT VAN GOGH



In 1888 van Gogh painted this portrait of himself in Paris *Van Gogh made many self* studies during his ten years of artistic creativity

he was seriously ill Vincent asked to be confined He was placed in an asylum in Saint Rémy near Arles for a year The attacks grew *more frequent and Theo brought* him to a doctor in Auvers a suburb of Paris Depressed by his illness and his dependence on Theo Vincent shot himself He *died July 29 1890*

Van Gogh made about 800 paintings and 900 drawings in all For his first several years he did little but draw and he became a master with pencil and pen and ink His paintings show a steady evolution of style During his Holland Belgium period (1880 85) he used somber earth tones as in his Potato Eaters In Paris (1886–88) he worked with the impressionists and was fascinated by their use of bright pure colors At Arles (1888 89) he used these colors with brilliant results in Sunflowers in a Vase and many other paintings At Saint Rémy (1889 90) his various *studies of cypresses and other pictures* show an even more daring technique

GOLD—*The Age-old* MEASURE *of* WEALTH

GOLD Through the ages men have *wanted gold for* ornaments because of its beautiful color and freedom from tarnish The unceasing demand made it *acceptable everywhere as money* But it was the most costly of all known metals Even though deposits are plentiful most of them do not yield enough gold to pay for the cost of extraction This *holds true for the gold which* is dissolved in sea water

Until recent times the combination of high demand and limited supply made gold the *most precious metal Today* there is a greater demand for other metals such as platinum These metals are still more difficult to obtain in quantity *and they have become more* precious than gold

The total world output of gold in the 450 years between 1492 and 1942 was about *50 000 tons If it were cast* into a cube it would measure less than 44 feet each way Approximately one-half is in national treasuries as gold bullion or gold coin *Perhaps a third has been used in the arts and crafts as jewelry* and decoration The remainder is not accounted for

TWO PROSPECTORS PAN FOR GOLD



The older man has washed the key material in a panful of water From time to time *a deft motion has thrown* aside much of the lighter material Any grains of gold there may be will remain in the pan

Influence of Gold on Civilization

The demand for gold has been a powerful force in history Nations have waged war for it Men have robbed and killed for it The very word gold has come to mean wealth which leads men to destroy themselves

The search for gold also has helped to spread civilization Men have willingly entered deserts and wilderness es to find it In the 15th century the Spaniards invaded Mexico and South America in search of gold In return they left the culture of the Old World

The gold rush of 1849 brought great hordes of gold seekers to California Many stayed and helped settle the territory *The discovery of* gold in 1851 started the mass colonization of Australia Discoveries of gold in Alaska and South Africa helped greatly *in the development of these* countries

Most of the gold mined before 1500 was found in the Spanish peninsula, Greece, Asia Minor, India, and the Ural Mountains of Russia. After the discovery of America, great supplies were obtained from Central and South America. But the total production from that time to the discovery of the California gold fields was less than one year's output today. The discovery of the California deposits (1848) and other great fields resulted in an enormous jump in production. The most important of these other discoveries were Australia (1851), British Columbia (1858), New Zealand (1861), British India (1884), Witwatersrand, South Africa (1886), and Alaska (1897).

Today from one-third to one-half of the annual world output is mined in South Africa. Russia ranks second in annual world production. Canada is in third place, and the United States (including Alaska) is fourth. Most of the Canadian output comes from Ontario. In the United States, California, Utah, South Dakota, and Colorado are the principal sources. Australia, Mexico, the Belgian Congo, Korea, Colombia, India, and Nicaragua are other important producers.

Methods of Mining Gold

Mining methods vary according to the nature of the deposit. Gold-bearing sand can be worked by *placer* mining. Veins in solid rock can be worked by *lode* or *quartz* mining.

Placer mining is simple, because nature has done most of the work. Age-long erosion of gold-bearing rock has scattered particles of the metal along stream beds. The particles vary from fine powder (gold dust) to the great Australian nugget called "Welcome Stranger." It weighed 2,520 ounces—as much as a medium-sized man.

Men separate gold from gravel or sand by washing the deposit in a swirl of water. The water carries away the gravel or sand, but the gold sinks to the bottom because it is extraordinarily heavy—19.3 times as dense as water. Washing may be done in a prospector's pan or in sluices. These are inclined troughs having riffles (bars or blocks) along the bottom to hold the gold.

WORKING IN THE GOLD RUSH OF 1849



Prospectors of the California gold rush of 1849 are shoveling gold-bearing gravel into sluices. Riffles catch the gold while the gravel is washed away.

Large deposits may be worked by *hydraulic* mining. Powerful streams of water wash the gravel into the sluices. In *gold dredging*, an endless chain of buckets is used to move the deposit. Mercury may be used to enrich the yield. It forms an amalgam with the gold. Then the gold is freed by heating the amalgam until the mercury vaporizes.

Placer mining was known in ancient times. Pictorial rock carvings in Egypt show gold washing as early as 4000 B.C. The Greek legend of the Golden Fleece may have been suggested by the use of fleeces to catch gold in ditches and flumes (inclined channels).

Methods of Lode Mining

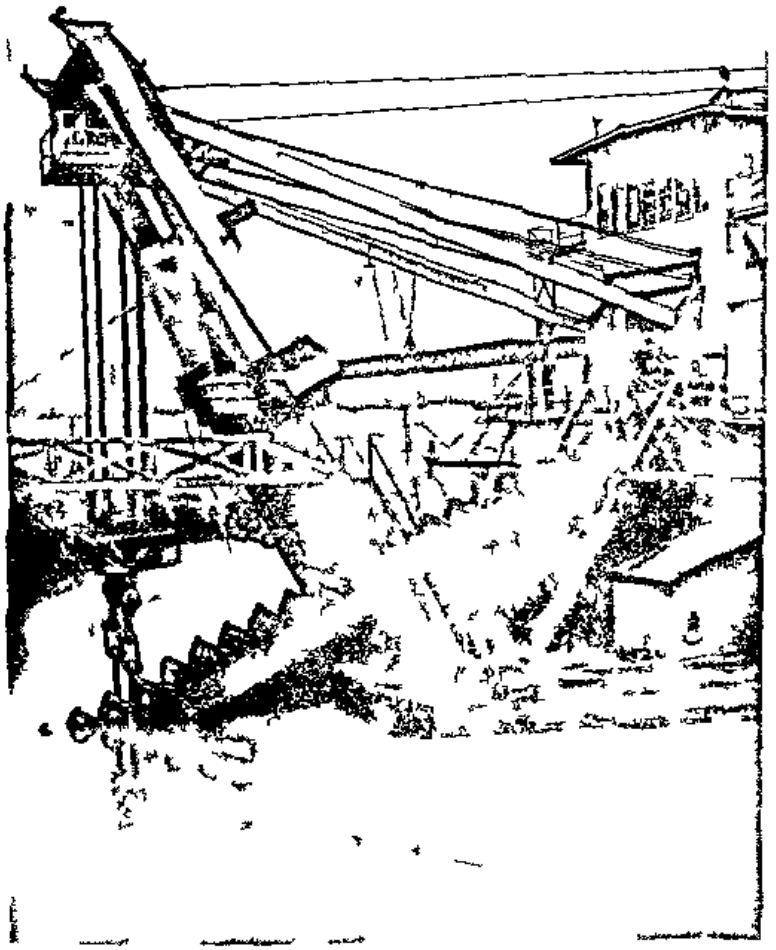
The known placer deposits are now largely exhausted, and most of the world's gold today is obtained by lode mining. Some gold mines are very deep. A mine in the Kolar district of Mysore, India, is more than 6,000 feet deep. The Morro Velho mine in Brazil and a mine in the Witwatersrand in South Africa have gone down more than 8,000 feet. Most gold is found "native" or free in quartz veins or alluvial (water-made) sands, often combined with silver. Small quantities are found in ores of lead, iron, tellurium, and copper.

The large mines have mills that separate gold from ore. Chunks of ore are crushed and watered to form a pulp. The pulp is then treated according to the nature of the ore.

To extract gold from its ores three consecutive processes are usually used. The first of these is *concentration* of the gold and one or more of its compounds, such as silver, or copper, by *flotation* (the ore is worked in a tank to cause the heavier gold and its compounds to sink to the bottom). The second process is a primary refining of the gold ore concentrate by *cyanidation* (dissolving tiny gold particles in a solution of sodium cyanide or potassium cyanide), *amalgamation* (attracting the gold from its ore with mercury), or *smelting* (melting). Final refinement to pure gold is usually done by *electrolysis* (attracting the pure gold to an electrode). (For an explanation of these processes, *see* Cyanides; Electrolysis; Mercury; Metals.)

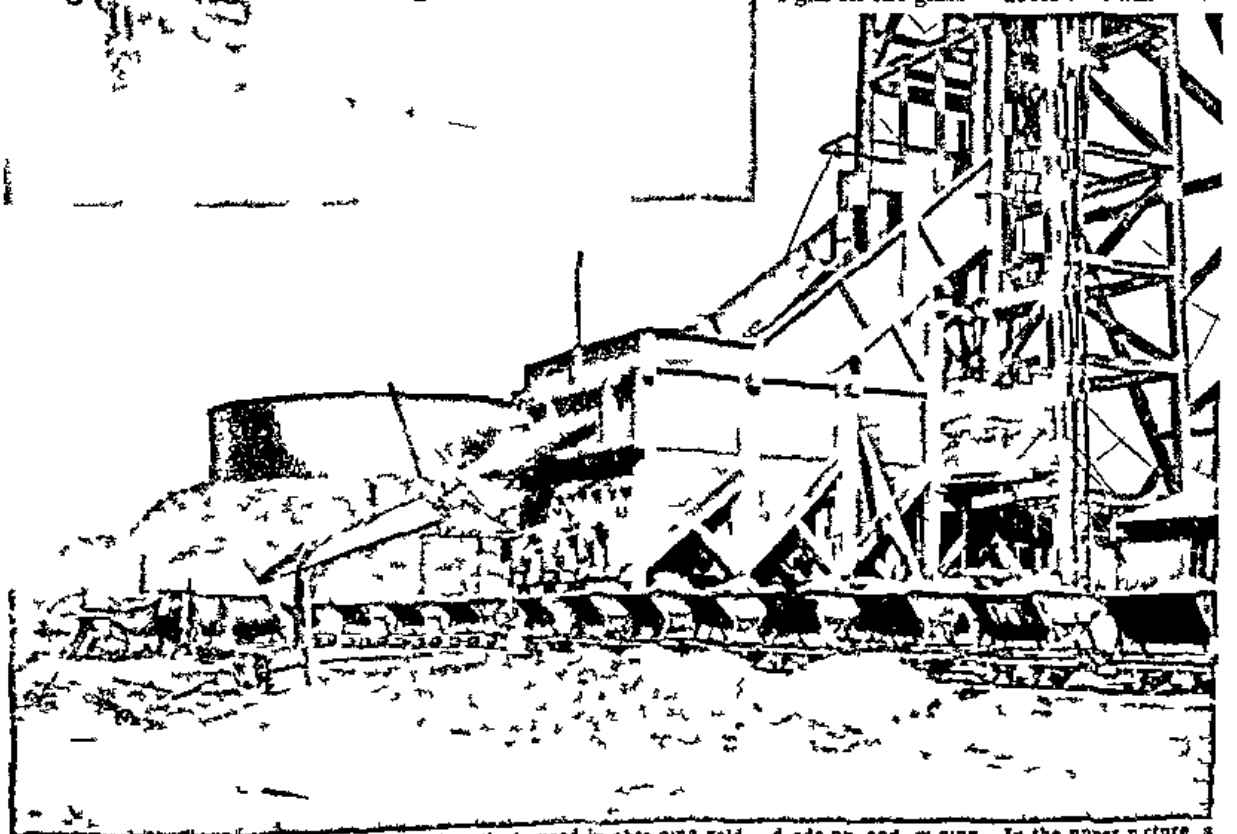
Gold is soft, and if pure gold were used to mint coins or to fashion into jewelry or decorative pieces it would quickly wear away. To make gold durable enough for these purposes, gold is *alloyed*, or combined, with harder materials (*see* Alloys). The white gold used for some jewelry pieces is a gold alloyed with platinum, palladium, nickel, zinc, or silver. Palladium-gold alloys are also used for making nonmagnetic watch springs. Green gold is a cadmium-gold alloy. A very poor imitation of gold is called pinchbeck. It is made of a copper-zinc alloy; it appears so unlike real gold that "pinchbeck" has come to mean cheap and tawdry. The gold coins of the

HOW THE PRECIOUS METAL IS DUG OUT



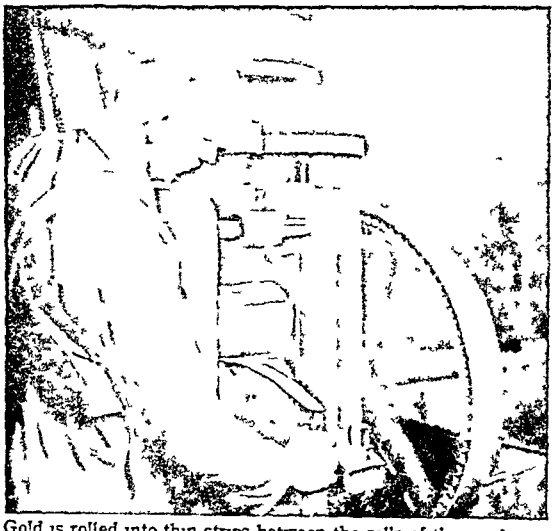
United States are alloyed with copper These metals change the color copper making the alloy redder than pure gold and silver whiter The proport on of gold contained in an alloy is expressed in two ways in *carats* that is the proportion on a scale of 24 or in *fineness* on a scale of 1 000 Pure gold is 1 000 parts or 24 carats fine Gold with 18 parts pure gold and 6 parts of alloy i 18-carat gold or 750 parts fine The legal standard for Great Britain s gol l coins is 22 carats or 916 6 parts but most countries including the United States have use l 21 6 carats or 900 parts Until 1934 fine or 24-carat gold was valued by law in the Un ted States at $20 67 an ounce Then Con gress authorized the President to fix its value with n certain limits (*see* Money)

Gold is the most malleable of metals it can be beaten to 1/250 000 of an inch It is placed between strips taken from the thin outs de membrane of the inte t ne of cattle and several layer are pounded at the same time The resulting gold leaf is used for lettering s gns on the glass of doors and windows



These mach nes represent two of the pr n pal methods used in obta ning gold — d edg ng and m ning In the upper p cture s the cha n of buckets w th wh ch the b g d *edge* scoops gold bearing g avel f om the bed of the Cal fornia r ver where it operates W thin the dredge is mach nery which ex acts the go d Below s the ent ance to a go d mine n the Transvaal, South *Afr* ca, show ng cars loaded w th ore

HOW GOLD IS PREPARED FOR USE IN INDUSTRY



Gold is rolled into thin strips between the rolls of the machine shown here The workman reduces the space between the rolls by turning the wheel at the top of the rolling machine.



Gold leaf is made by cutting the strips into squares, placing each between layers of gut, and pounding Hours of pounding can reduce the squares to 1/250,000 of an inch in thickness

for interior and sometimes exterior decorations, for picture frames and for experimental work in electricity

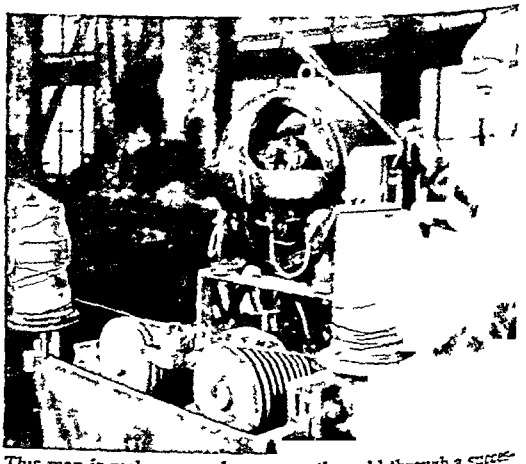
Gold is also the most ductile of metals Wires compounded of silver and gold have been drawn to such fineness that 20,000 of them would be less than an inch thick and a length of 500 feet weighs only one grain Gold lace is made of thin gold wires so fine that from 1 100 to 2 000 yards weigh no more than one ounce These wires are flattened into ribbons, wound over silk thread. and then made into lace. Cheaper varieties of gold lace are made of thin copper wire plated with gold

Rolled gold is produced by applying thin sheets of gold to a plate of soft alloy and rolling them together until the gold and the alloy are firmly welded Rolled gold is made into such articles as watchcases, jewelry settings, and other jewelry pieces

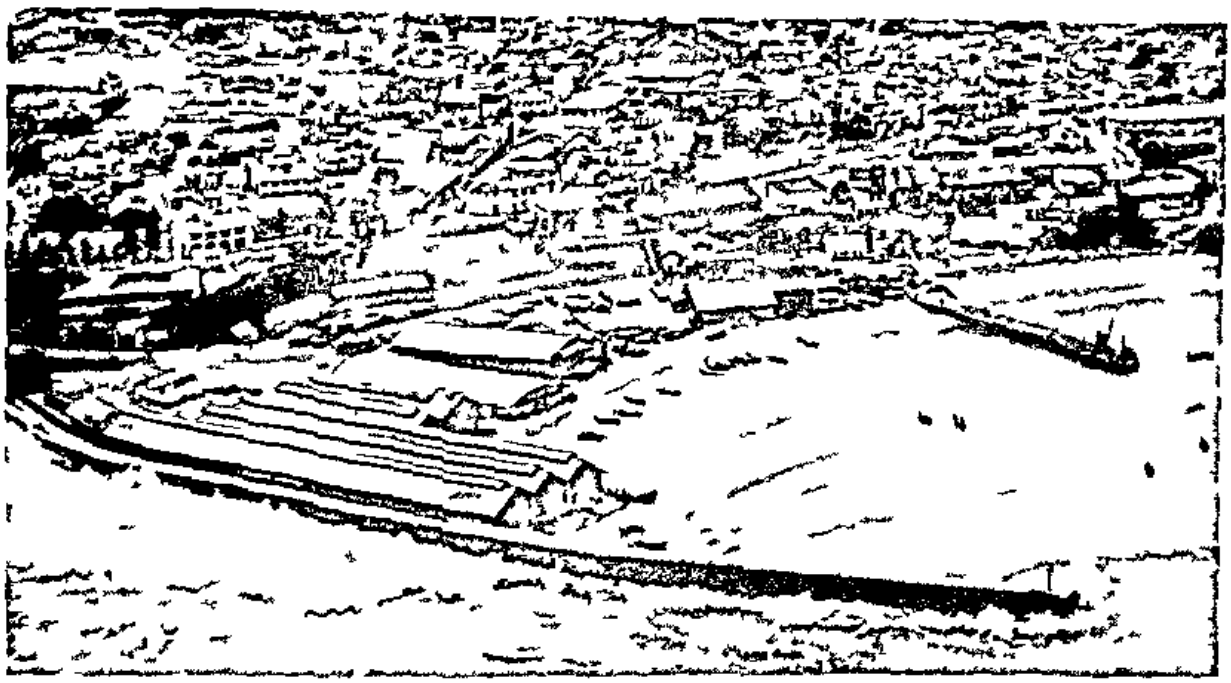
Gold resists chemical action to a greater degree than any other common metal. One of the few acids which will dissolve it is a mixture of nitric and hydrochloric acids Early experimenters called this mixture *aqua regia* ("royal water") because of its power to dissolve gold The resulting chloride of gold, in combination with certain other chlorides, forms salts which are called gold chloride and are used in photography In combination with tin chloride, gold chloride produces a fine purple pigment, called purple of Cassius, which gives a rich pink, rose, or red color to glass, pottery, and enamel About three fourths of the world's production of gold is used for commercial purposes The rest is made into coins or is held in bars as a reserve to maintain the value of paper money. The United States no longer makes gold coins Its reserve of gold, worth many billions of dollars, is stored in heavily guarded vaults at Fort Knox, Ky. (*see* Kentucky).



Here the workman is making gold wire He passes a gold rod into a machine where it is beaten by many little hammers The beating reduces the rod to wire of the desired diameter.



This man is making wire by passing the gold through a succession of dies, each smaller than the last. Gold wire can be made so fine that a 500-foot length weighs only one grain.



ACCRA S MAN MADE HARBOR
A ong b eakwater protects Accra s docks f om the At antic waves The c ty grew around Bri ish Dutch and Danish forts

GOLD COAST *All Afri* ca watches Brita n s Gold Coast Colony and Protec torate *Here for the first time starting in* 1951 a Negro Africa colony exper ments in *self government* The prime minister and the nembers of the cabinet and the leg slative assembly are all Africans (for picture *see Afr ca*) *Men and women* vote on equal terms A woman was elected to the assembly The Gold *Coast* nowever st ll has a *Br tish* governor wl o is respons ble to the Br tish Parl ament in London



The Gold *Coast* (*total area* 91 843 square m les) n cludes Gold Coast Colony (23 937) two protectorates Ashanti (24 379) and the *Northern Ter itor es* (30 486) and the British trusteeship of *Togoland* (13 041) The Gold Coast is north of *the equator* where Afr ca s west coast bulges into the Atlantic It ex tends along the Gulf of Gu nea between *French Togo*land and the Ivory Coast (for map *see Africa*)

The Land and the People

The coast line is sl o tha l has n o natural harbors A narrow gra sy pla n sep a ates its sandy beaches fro n the gradually r s g sl pes of the inter or plateau An occas onal rocky l ea land juts so ut ar d from the plateau toward the sea The co tal reg n is the dr est part of the Gold Coast *Ra nfall is fairly* heavy on the plateau s slopes and there are steamy tropical forests where the trees have *huge trunks* and grow up from the forest floor in a tangle of c eepers and vines The surface of the plateau is a rolling land with fe v hills and no mountains *It has both* semitrop al w oodlands and grasslands The country *is* well watered w th many *small rivers emptying into* the sea The largest river is the Volta

The plants and animals of the Gold Coast reg on *are typical of most of West Africa s coast* The pr nci pal trees are the s lk cotton and hardwoods such as mahogany ebony and camwood Smaller trees are the bamboo and mimosa Orchids lilies and great ferns grow n the forests Mangroves grow at the river mouths There are p neapples bananas and other *fru ts Typ cal an mals are panthers leopards lemurs* antelopes jackals and many types of monkeys The snakes include pythons cobras and adders The Volta s nfested w th crocodiles and has herds of hippopotamuses There are sharks swordfish sting rays dol phins and other fish in the coastal waters

There are 4 905 000 people in the Gold Coast (1953 est mate) Almost all these are Negroes of the purest type found in Africa Only in the far north has there been any considerable mixture with Ham tes (*see* Africa) There are a number of organ zed tribes The principal ones are the Fanti and Ashanti

The Ashanti have their own language (Akan) and cling to t e r old trad tions Th e r king is called the Asantehene For centuries t e cl ef symbol of authority of t e Ashanti l as been the r golden stool It looks some what l ke a gol l plated chair and even the Asantel ene does not dare sit on it The *Ashanti capital is Kumasi Kumasi is a sprawling* to n with a population of 77 689 There are mud and frame houses with tin roofs Some have walls of cor rugated iron The crowded bazaars have small shops with thatched canopies where artisans and traders l awk their wares More prim tive peoples live in small



ASHANTI BOYS ON A HOLIDAY

Many young Africans go for their vacations to camps maintained by the Gold Coast Department of Social Welfare.

villages where the huts are sometimes oval or shaped like mushrooms Farming, herding, fishing, and mining are the chief occupations

The capital of the entire Gold Coast is Accra (135,192). Here are more corrugated-iron buildings There are also whitewashed mission churches, trading company warehouses, crowded streets, noisy bazaars, an international airport, and a broadcasting station. The principal port is Takoradi (17,327).

Farming, Mining, and Trade

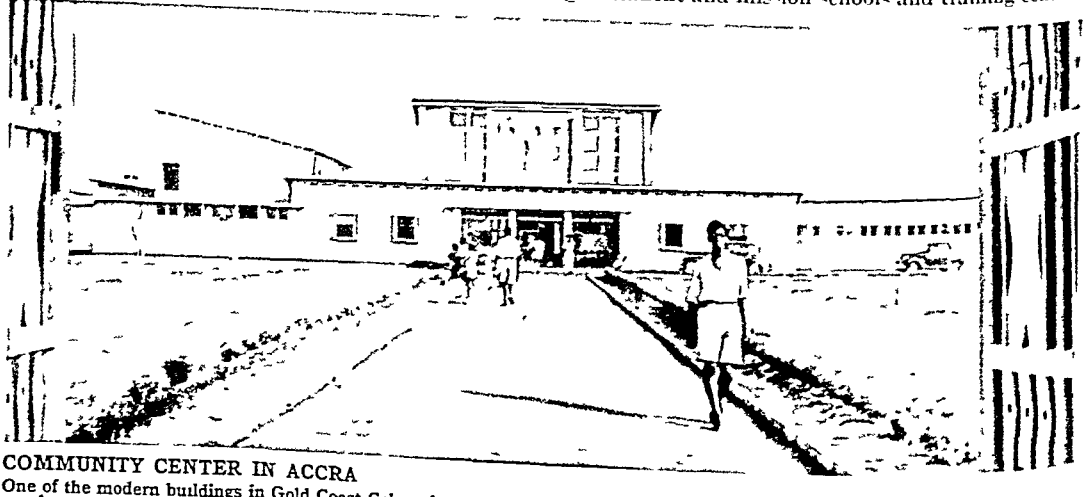
Gold and the slave trade first made this coast famous and gave it its name. Today, however, another product has far exceeded gold in importance—cocoa. About one half the world's supply came from the Gold Coast until the spread of a blight called "swollen shoot." Eventually it was checked and the cocoa trade was built up again. Cacao is raised in forest clearings and exported from Accra and Takoradi, which are connected by rail with Kumasi Other leading crops are sorghum millet, maize, and the kola nut The lumber industry is important. Gold is still produced along with manganese, diamonds and other minerals Cocoa and these minerals are the chief exports The principal imports are cotton goods, petroleum products, machinery, and tobacco

History

Early in the 15th century, Portuguese explorers landed on the Gold Coast Later in the century they established a settlement at Elmina as a headquarters for the slave trade Most of the slaves from this region went to the North and South American colonies. The Dutch British and French joined the slave trade; all but the British finally withdrew.

The British abolished slavery throughout the empire in 1833. They established the Gold Coast as a crown colony in 1874. The protectorates over Ashanti and the Northern Territories were established in 1901 after an Ashanti revolt had been crushed

In World War I Gold Coast troops, aided by French forces, invaded German Togoland After the war Togoland was divided between Britain and France Britain's mandate over Togoland became a United Nations trusteeship after World War II There are government and mission schools and training centers.



COMMUNITY CENTER IN ACCRA

One of the modern buildings in Gold Coast Colony is this community center. Note the mosaic over the entrance. In the past the finest sculpture in Negro Africa came from the West Coast. This is an excellent 20th-century adaptation of an ancient art.

GOLDENROD Growing wild throughout North America the goldenrods brighten the late summer and autumn landscape In the eastern part of the continent there are about 60 different kinds Several more grow on the Pacific coast They flourish in every kind of surrounding—in open fields and roadsides in woods along the ocean beach and on mountainsides Most of them are golden yellow but one kind the silverrod is silvery white

Goldenrods belong to the family of composite flowers (*Compositae*) and are related to the asters The tiny flowers grow in clusters Two of the commonest species are the Canada and tall oldfield goldenrods Their flowers are gathered into numerous long plumes at the top of a slender stem 2 to 4 feet high Other kinds are shaped like low bushes with the flowers at the top of branching stems The blue-stemmed or wreath goldenrod has a stem 18 inches tall closely set with lance shaped leaves Growing out of the bases of the leaves are inch long sprays of flowers *Charming wreaths can be made from the plant*

Goldenrods belong to the genus *Solidago* The word means to strengthen or make whole referring to the supposed healing properties of the plant The Canada goldenrod is *Solidago canadensis* oldfield goldenrod is *Solidago nemoralis* The latter is the state flower of Alabama Kentucky and Nebraska

GOLDFINCH A purple thistle rocking with the weight of a goldfinch is a beautiful sight These charming little birds are about five inches long The male is yellow with black cap wings and tail (for picture in color *see* Nature Study) The female is olive green and dull yellow The musical song resembles that of the European caged canary hence the popular name of wild canary In flight the bird bounds through the air in a wavy motion calling *per chic o ree per-chic o-ree*

The nest is made of fine grasses shredded bark and moss lined with thistledown There are 3 to 6 blue-white eggs (for picture in color *see* Egg) The birds feed chiefly on weed seeds

The goldfinch is a permanent year round resident in most of the United States It is the state bird of Minnesota (unofficial) Iowa and New Jersey The willow goldfinch the state bird of Washington is similar to the eastern species The scientific name of eastern and willow goldfinches is *Spinus tristis*

GOLDFISH The ancestor of the goldfish is the dull colored carp The brilliant reds and golds with markings of silver and black have come from the patient work of Chinese and Japanese fish breeders After goldfish escape into rivers and streams their descendants gradually resume the greenish hue of the carp Some of the most valuable goldfish are not golden at all Their colors range from near white and pastel hues to startling black

Goldfish are bred for shape as well as for color A beautiful variety is the fringetail which sweeps its enormous shimmering tail in graceful patterns Grotesque forms are also highly prized A favorite is the black telescope fish with huge bulging eyes

Globes rarely give goldfish enough air because the curving sides provide too small a surface for the water The best aquarium contains growing water plants (*see* Aquarium) Goldfish are usually fed once a day at a regular time and only as much as they can eat in about five minutes Many goldfish are fed only wafers But the fish are scavengers and enjoy worms flies and daphnia (tiny crustaceans) Goldfish spawn from April to May The female lays from 10 to 20 eggs at a time totaling 500 or more The eggs hatch in three to seven days The scientific name of the goldfish is *Carassius auratus*

GOLDSMITH OLIVER (1728–1774) By the time Oliver Goldsmith was 30 years old his carelessness and love of fun had brought failure in everything he had tried Finally he became a hack writer turning out books and articles on all sorts of subjects for the London booksellers However he took time to work slowly and carefully on a few pieces that brought him lasting fame They were a novel The Vicar of Wakefield a play She Stoops to Conquer and a long poem The Deserted Village

Goldsmith was born in a small Irish village (usually believed to be Pallas near Ballymahon) on Nov 10 1728 His father was a poor Anglican clergyman Oliver was the fifth of eight children

OLIVER GOLDSMITH



Goldsmith's friend Sir Joshua Reynolds painted this portrait.

In boyhood he was awkward and slight and an early attack of smallpox disfigured his skin But he was clever and ready with a witty answer

When he was not quite 16 years old he entered Trinity College Dublin as a sizar (a student who works for his tuition) He was always involved in some scrape He studied little but he managed to earn a bachelor of arts degree by 1749

Then Goldsmith studied theology law and medicine in turn for a year or two each but he preferred fishing and flute playing to books He traveled for a year in Europe then settled in London He claimed to be a physician with a degree from a foreign university, and people called him doctor Nobody came for treatment and so he turned to writing

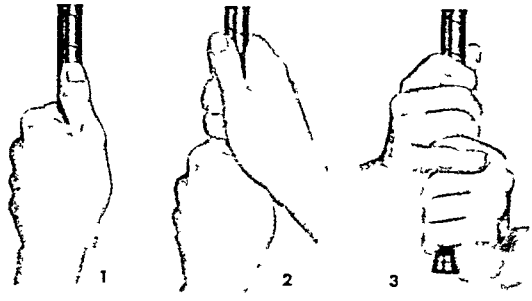
Goldsmith's essays The Citizen of the World (1762) won the attention of Samuel Johnson, then England's leading man of letters (*see* Johnson, Samuel) Johnson included Goldsmith among his circle of friends Though they laughed at Goldsmith's odd ways they liked him Writing brought Goldsmith a fair income but he was perpetually in debt for clothes, entertainment and gambling He died at 46, after trying to cure himself of a fever

Golf—A GAME *Everyone* CAN PLAY

GOLF. One of the best games for both young and old is golf. Expert players have been as young as 14 and as old as 60. Young or old, players like the game because each person plays for himself. The score depends solely on the golfer's own ability and effort. Golf also has a wide appeal as a physical exercise. Each player can set his own pace. Intervals of play are mixed with walking and waiting for other golfers.

Golf stresses courtesy and sportsmanship. During play, a golfer stands quietly aside while his opponent makes his strokes. He assists in every way to give his competitors an equal chance. Should a member of a golfing party lose a ball, the other players search for it as thoroughly as if it were their own. Golf also puts a player on his honor, for he usually keeps his own score.

MOST GOLFERS USE THE OVERLAPPING GRIP



1. The left hand holds the club firmly with the thumb on the shaft. 2. The right hand closes around the club so that the left thumb fits into the right palm 3. This picture shows how the fingers grasp the club. The right little finger overlaps the left forefinger.

Low Scores Win on a Golf Course

A golf course consists of 9 or 18 *holes*, spaced from about 100 yards to more than 600 yards apart. Each hole is a metal cup 4¼ inches in diameter, which is sunk into the ground. The object of the game is to hit the ball into each of the holes in the fewest possible number of strokes. Every swing at the ball counts as a stroke even if the attempt fails to touch the ball.

At the beginning of each hole is the smooth teeing ground, or *tee*. From here the player drives the ball along the *fairway*, a broad avenue of turf stretching out to the front. Flanking it on both sides is tall grass, often studded with trees or shrubs, called the *rough*. The fairway may have no obstructions or it may be cut by a *hazard*, which forms a trap for the unwary player. A hazard is either natural, such as a brook or pond, or artificial, such as a mound of earth (bunker) or sand trap. If the golfer hits his ball into one of these hazards, he may have difficulty in knocking it out. But if he plays skillfully, he keeps his ball on the fairway and thus does not need to use any unnecessary strokes.

Par Is Every Golfer's Goal

At the end of each fairway lies the *green*, a comparatively level plot of irregular shape varying from about 2,000 to 8,000 square feet in area. Here the grass is cropped close for accurate play. Sunk in the green is the hole itself. The cup is marked by a flag or other device on a pole to help players locate the hole from a distance. A player completes a hole by hitting his ball into the cup. He then moves on to the next tee and continues to play in the same manner until he has made the round of the course.

Par for each hole consists of the estimated number of strokes required to reach the green plus two additional strokes (called *putts*) for the green itself. A golfer has only about one chance in 10,000 of making an *ace*, or hole-in-one, from the tee. More common is the *eagle*, or two strokes under par for a hole, and the *birdie*, or one stroke under par.

A par 3 hole is usually less than 250 yards in length. Par 4 is from 251 to 445 yards; par 5 from 446 to 600 yards; and par 6 more than 600 yards. Normal par for 9 holes is 36. For women's par, one additional stroke is added on the longer holes.

In *match* play, one golfer competes against another, and the strokes for each hole are counted separately. The player who wins the most holes is the victor. Whenever they both complete a hole in the same number of strokes, the hole is *halved* and counts for neither. In *medal* play the player with the lowest total number of strokes is the winner. He need not win the most holes. Amateur tournaments are usually conducted at match play; professional tournaments, at medal play.

A Golf Club for Every Purpose

The ball weighs 1.62 ounces and is either 1.62 or 1.68 inches in diameter. It is made of many strands of rubber tightly wound around a core of rubber liquid or paste. The ball then receives a coat of vulcanized rubber. The cover is made of balata. The outer surface is dimpled to lessen wind resistance and give greater carrying power to the ball.

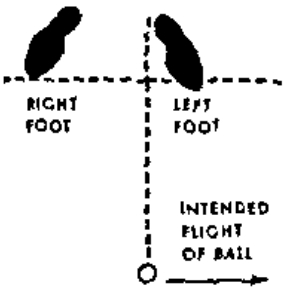
Golf clubs have slender shafts about three and one-half feet in length. They are usually made of steel tubing. Each has a strong wooden or iron head with a striking face for hitting the ball. When driving off at the beginning of each hole, the player may "tee up" the ball on a small elevation. For other strokes the ball must be hit where it lies.

Each club is designed for a particular kind of stroke. To hit the ball long distances, golfers use wooden-headed clubs called *drivers*. Two hundred yards is a fair drive but expert players can average 250 yards or more. There are four wood clubs of this type: No. 1 (Driver), No. 2 (Brassie), No. 3 (Spoon), and No. 4 Wood (Short Spoon or Cleek).

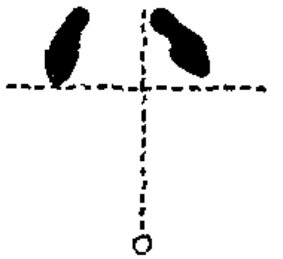
The iron clubs, or *irons*, are designed for hitting the ball low and far, or raising it high in the air and letting it fall dead, or lifting the ball out of sand traps and tall grass. Each club is named but is more familiarly known by number from 1 to 9. The low-numbered irons drive the ball for medium dis-

HOW AN EXPERT GOLFER HITS THE BALL

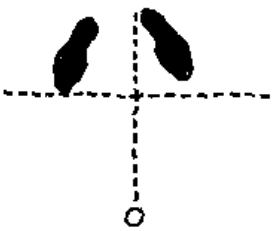
One of the most important parts of the golf swing is the position of the golfer's feet (called the *stance*) Below at left are stances for five common strokes The correct stance helps produce a good swing, as shown below at the right



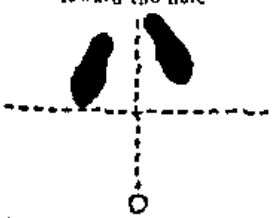
THE DRIVE The golfer stands with his feet on an imaginary line which is parallel to the intended flight of the ball His left heel is about on line with the ball



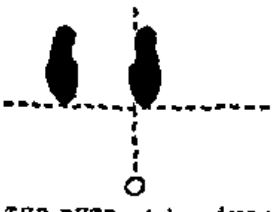
LONG IRON SHOT The golfer stands closer to the ball than for the drive The right foot is slightly forward of the left



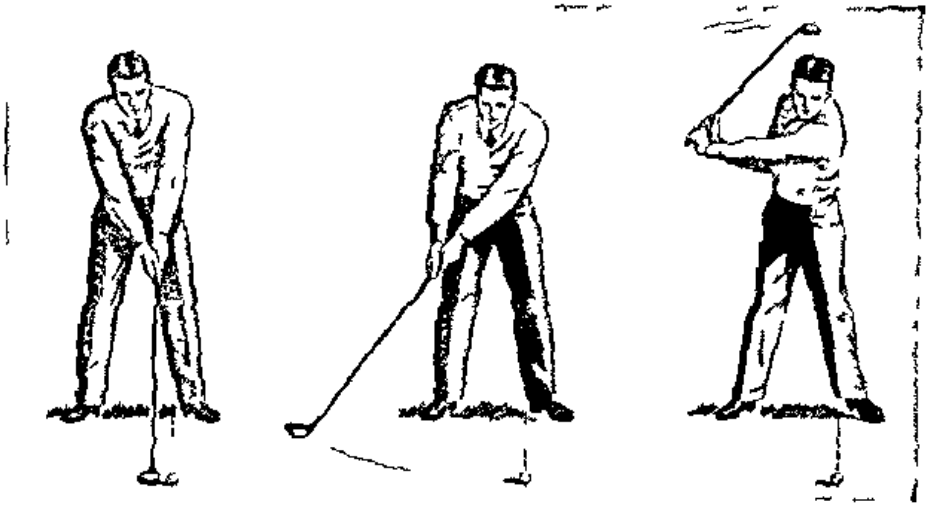
MASHIE SHOT The golfer stands closer to the ball than for the shots above The stance turns his body slightly toward the hole



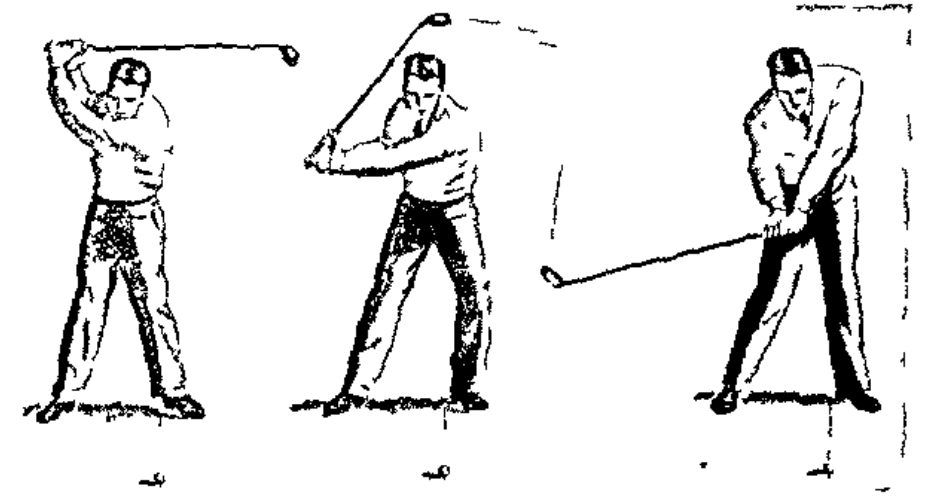
CHIP SHOT The golfer stands even closer to the ball His body is turned more toward the hole by placing the right foot well forward



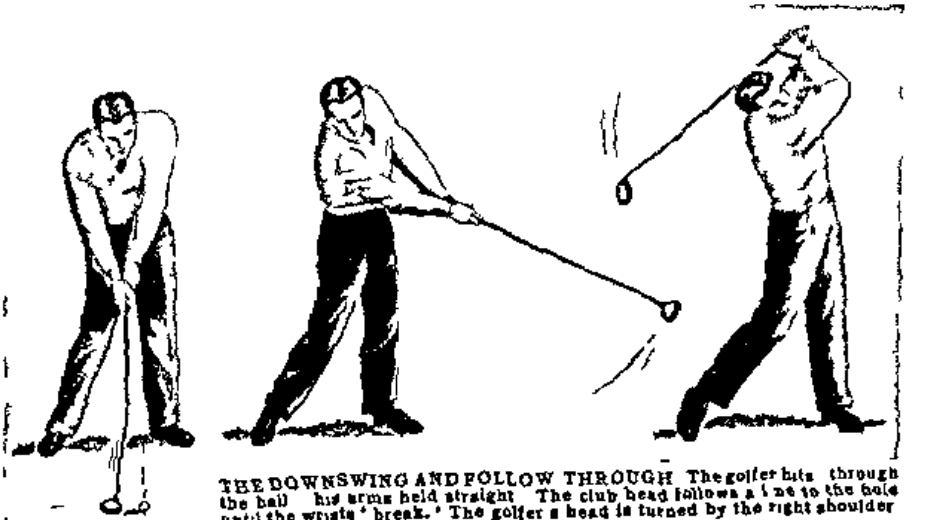
THE PUTT A line drawn through the ball would pass near the golfer's left toe His feet are together with the toes pointed straight ahead



THE BACKSWING The golfer bends slightly at the waist with his weight resting equally on both feet He winds up by turning his body to the right Shoulders, arms, and club follow the body turn The left arm is held straight without stiffness His eyes keep watching the ball

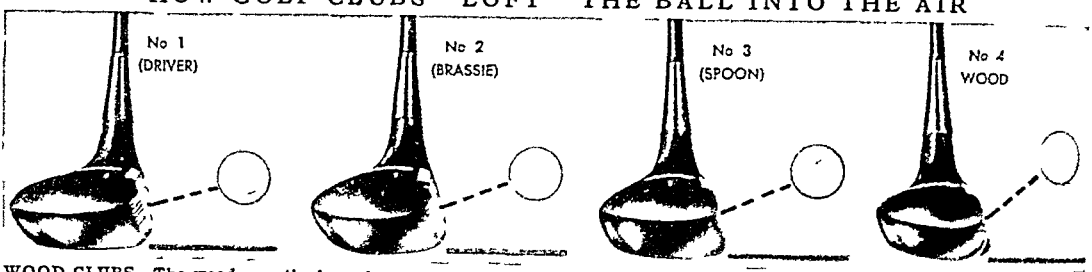


THE TOP OF THE SWING The golfer turns until the club shaft is about horizontal to the ground He begins the downswing by turning his body to the left As his body moves it pulls the arms down The wrists straighten into line with the left arm Speed is more important than force



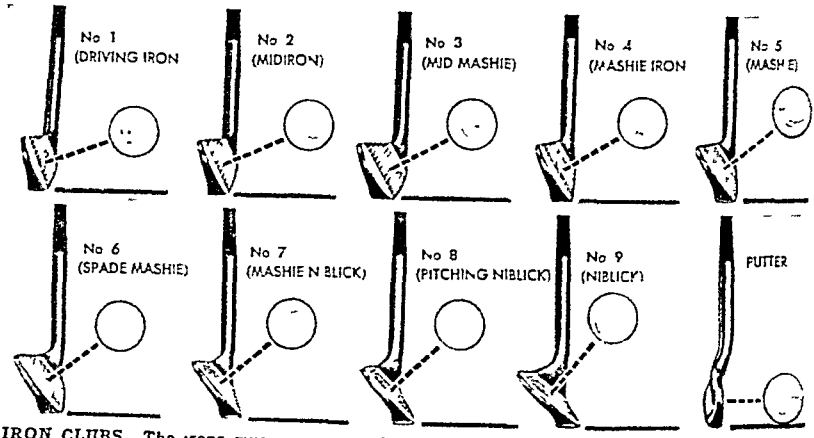
THE DOWNSWING AND FOLLOW THROUGH The golfer hits through the ball his arms held straight The club head follows a line to the hole until the wrists "break." The golfer's head is turned by the right shoulder

HOW GOLF CLUBS "LOFT" THE BALL INTO THE AIR



WOOD CLUBS The woods are the long-distance hitters of golf They are used for driving off the tee and when long shots are needed on the fairway. Notice that the more loft (slant) there is on a club face, the higher the club drives the ball into the air

tances. The high numbered clubs are heavier and shorter. They have more *loft*—that is, slant on the striking face. The greater the loft, the higher the ball rises in the air and the shorter the drive. These high-numbered clubs are valuable for *chip shots* to lift the ball onto the green and *pitch shots* to clear a hazard. On the green, golfers use short, straight-faced clubs called *putters*. The clubs are carried in a bag by the golfer or his *caddie*.



IRON CLUBS. The irons give accuracy rather than long drives. Nos 1, 2 and 3 are distance clubs, producing drives from 210 to 150 yards Nos. 4, 5, and 6 are lofting irons for arching the ball into the air. They produce drives from 150 to 100 yards. Nos. 7 and 8 are pitching clubs for short, quick-rising shots No. 9 lifts the ball out of the "rough," such as sand or heavy grass The putter has a vertical striking face to roll the ball across the green to the cup.

The beginner should have at least five clubs: a driver (either No. 2 or No. 3 wood), the No. 3, 5, and 7 irons, and a putter. The maximum number of clubs that can be carried in official tournament play is 14: four woods, nine irons, and a putter.

Tournaments for Amateurs and Professionals

In the United States the rules for amateur players are made by the United States Golf Association (USGA). Professional golfers, such as those who play for money or who receive money for giving golf instruction, follow the rules made by the Professional Golfers Association (PGA). The associations conduct tournaments for amateurs and professionals respectively. Both amateurs and professionals compete in *open* tournaments. Some of the leading tournaments include the United States Open, Men's Amateur, Women's Amateur, and Men's Professional; and the British Amateur and the British Open.

In 1930 Bobby Jones of Atlanta made golf's only "grand slam" by winning the United States Open, the United States Amateur, the British Open, and the British Amateur. Competition between British and American golf teams includes biennial play for the Walker Cup (amateur men), the Ryder Cup (professional men), and the Curtis Cup (amateur women).

Golf Developed in Scotland

Games similar to golf have been played in several countries since ancient times. But the modern sport developed first in Scotland in the 14th or 15th century. The Scots played golf so enthusiastically that some feared the game might replace the national sport of archery. As a result, Parliament banned golf in 1457. But after King James IV took up the sport about 1490 the law was not enforced. Scotland is also the home of the world's oldest golf course, St. Andrews at Fife, founded about 1552.

In the United States the modern game was first played on a three-hole course laid out in a pasture at Yonkers, N. Y., in 1888. Golf, however, received little popular support until 1913, when Francis Ouimet, a 20-year-old former caddie, won the United States Open Tournament over heavily favored British stars Ouimet's victory gained nation-wide attention and thereafter interest in the sport boomed. In the United States today almost three million people play golf each year on more than 4,900 courses. About a thousand high schools and colleges now teach golf as part of their physical education programs

In 1949 Golf's Hall of Fame to honor outstanding players was established at Evanston, Ill. The first four candidates selected were: Bobby Jones of Atlanta; Francis Ouimet of Boston; Walter Hagen of Detroit pioneer in international professional tournaments; and Gene Sarazen of Germantown, N. Y., prominent professional for more than 25 years. Additional nominations are made by the Golf Writers Association

GOMPERS SAMUEL (1850 1924) The life of Samuel Gompers is the story of a poor immigrant boy who became the first great labor leader in America Gompers helped found the American Federation of Labor and he developed it from a feeble group of 25 craft unions into a powerful body of almost 150 unions with about 4 000 000 workers

Gompers was born in a London tenement the son of a poor Jewish cigar maker To help support his family he left school at the age of ten to work for a shoemaker Several months later he became apprenticed to a cigar maker

When he was 13 years old his parents brought him to *New York City* *He got work in a cigar factory* where the workers had a plan for self education Each one in turn read aloud from books or newspapers while the others rolled cigars Each day all the cigars were equally divided among the workers

When Gompers was 17 years old he married a working girl Sophia Julian They raised three sons and two daughters A year after Sophia died in 1920 Gompers married Gertrude Neuscheler a music teacher who later became active in the union labor movement

In 1877 the Cigarmakers Union was all but ruined by losing a prolonged strike Gompers became president of his local and he and a few others started to rebuild locals and the national union according to their ideas They believed that socialist programs for cooperative businesses or taking over control of business were impractical Workingmen they thought would stay united only when striving for higher wages and better conditions Labor parties could not compete successfully with the skilled politicians of the great parties And they believed in drawing all the local

SAMUEL GOMPERS



He helped found the A F of L serving 37 years as president

unions of a craft together into a single strong national union

Gompers was a dramatic speaker and he could work endlessly without tiring Soon he built his national union into a model for all others In 1881 he helped organize a group of national unions which took the name American Federation of Labor in 1886 *Gompers became* president and except for one year (1895) he held this office until he died in 1924 During the first World War Gompers served as spokesman for labor In 1921 he became president of the Pan American Federation of Labor

GOOSE *Many people think that the goose is silly* and stupid But some nature students say it is perhaps the wisest of birds For example when great flocks of wild geese migrate they carefully scan their feeding grounds for danger They fly swiftly back and forth over a marsh or lake or field and if they spy a hunter they soar away to another feeding ground Nature students also point out that the domestic goose can be easily trained to be a pet and to obey orders Geese are strong and spirited If a person threatens to harm a young goose or gosling the parent geese will rush at him hissing and beating him with their huge powerful wings

There are about 30 species of wild geese belonging to the same family as the ducks and swans The

WILD GEESE AT HOME FOR THE SUMMER IN CANADA

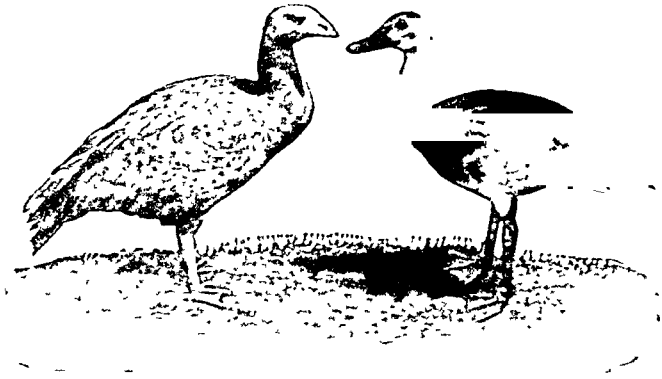


This habitat group from the American Museum of *Natural History* shows a pair of Canada geese with their brood of two-week-old chicks feeding on the marshes of Saskatchewan Canada geese are easily identified by the broad white band around the black cheeks and throat In the fall the young birds fly with their parents to the Gulf of Mexico for the winter

male, called the "gander," resembles the female in plumage. All breed in cool and temperate regions, some in the Arctic Circle. All migrate south for the winter. Geese live to be at least 30 or 40 years old.

Of the European wild geese the "graylag" is the most representative. It ranges over nearly the whole of Europe and northern Asia, and is the original of most domestic geese. China is the home of the "swan-goose," the largest known variety, and the parent stock of the domestic geese of the Orient. The "Cape Barron goose," which is remarkable for the shortness of its beak, is found in Australia.

TWO GEESE OF DISTANT LANDS



To meet the sharp-nosed goose on the left, you would have to go to Australia, for he is a Cape Barron goose with an extremely short beak like a turkey's. He can get around on land much more rapidly than the ordinary goose, but he lacks the family fondness for swimming and flying. Facing him is the African spur-winged goose, who gets his name from a long spur on each wing. He has more of the family nose, as you see.

The "Canada goose" is the most familiar of American wild geese. It is a grain-feeding bird and its flesh is most palatable. Breeding in Canada or the northern United States, it stops in its southward migration to visit the grain and stubble fields of the great northwest, often remaining in the Dakotas until mercury has reached 20° below zero. This is the harvest time for sportsmen, and often family larders are provided with meat from this source for the entire season. The birds are about 40 inches in length, light gray plumage below and darker grayish brown above, with a black head. In their spring flight north they are welcomed as an unfailing sign of coming summer. They fly high, in a V-shaped wedge, their joyous honking claiming attention of young and old:

> Hark what a clamor goes winging through the sky!
> Look, children! Listen to the sound so wild and high!
> Like a peal of broken bells,—kling, klang, kling—
> Far and high the wild geese cry, "Spring! It is spring!"
> —*Celia Thaxter.*

The "snow goose" is a pure white arctic bird that migrates to the Gulf States in America and to Japan on the Asiatic coast. They are still numerous along the Pacific coast during the winter. The "brant" is a small goose common throughout the Northern Hemisphere. In early autumn these birds come by the thousands to the coasts of the United States, and are a plentiful and valuable source of food supply for our tables.

Domestic geese date from a very remote period, as they are shown on the monuments of ancient Egypt. Wing-feathers of the goose feathered man's arrows in the Middle Ages, and supplied him with quill pens until steel pens took their place.

Geese belong to the order *Anseriformes*. Scientific name of Canada goose, *Branta canadensis:* of American brant, *Branta bernicla hrota;* of snow goose, *Chen hyperborea.*

GOOSEBERRY. The tart flavor of the gooseberry is enjoyed in sauce, jam, and marmalade, but does not greatly tempt one to pick and eat the raw fruit. Even as the fruit ripens, changing from green to a rich dark purple, the acid flavor lingers, especially around the coarse seeds. So the gooseberry is not very popular among garden fruits, and much of our supply comes from the bushes growing wild all through the northern part of the United States. Varieties of the gooseberry are also native to the north temperate regions of the Old World, but everywhere the cultivation of the fruit has been neglected with the exception of England. There cultivation began in the 16th century, with the result that English markets have gooseberries as large as plums and sweet enough to eat just as they are picked from the bush.

The gooseberry is a hardy spiny shrub closely related to the currant. Scientific name, *Ribes grossularia.*

GOPHER. In the early days French settlers gave the name "gopher" to several species of burrowing animals of the rodent family. The name comes from the French *gaufre* ("honeycomb"), and was given because the little animals honeycomb the ground by burrowing in it. They do much damage to the crops and are considered a great pest by the farmers.

The prairie pocket gopher commits its depredations in the fertile prairie region of the farther northwest. It is about as long as a small rat, with a body considerably thicker; in the skin of each cheek is a large pocket or pouch in which to carry stores of food. The fore feet are very strong and are equipped with long claws for digging.

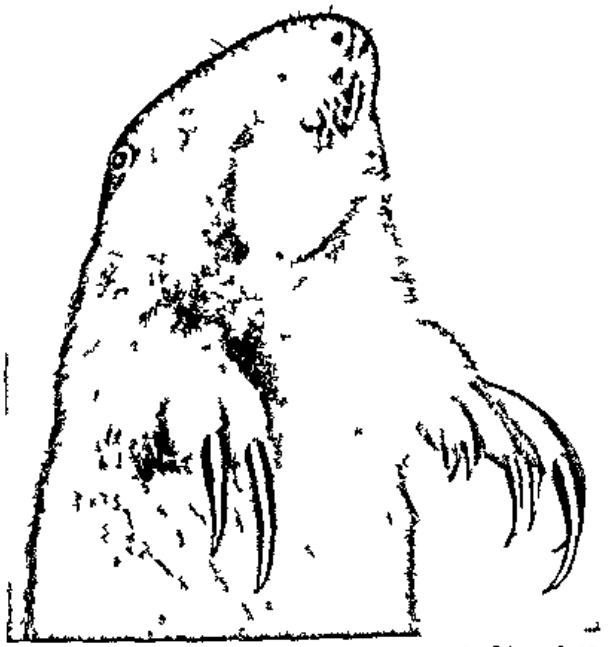
With his hind feet the gopher scrapes from beneath his body the dirt the front feet have dug and throws it back a distance of 8 or 10 inches. When a little pile has been made in this way, the gopher turns around and putting his forepaws in front of his nose pushes the dirt before him through one of his "cellar doors" and so makes the little piles called gopher hills.

The gopher's teeth make something like 200 strokes a minute. The enamel plates of the molar teeth are arranged in such a way that 38 distinct single cuts are made with every forward thrust of the jaw and

28 by the back stroke Multiply that by 200 and it amounts to over 13 000 cuts every minute

To keep food for winter use gophers have regular storehouses—pantries as it were—to which they carry roots and other food in their cheek pockets In

AN EFFICIENT DIGGER UNDERGROUND



A gopher is well equipped for life underground Those long clawslike *on the forefeet dig out the burrows* The dagger like projecting teeth are also used to dig and to tear loose roots and bulbs The lips close tightly behind the teeth to prevent dirt from getting into the mouth As the food is cut the forepaws shove it into the external cheek pouches The eyes are small and weak The ears are concealed under the skin

one gopher storehouse in the winter time were found nearly 50 tiger lily bulbs gathered the previous fall and carried through a tunnel from the tiger lily bed to the gopher pantry Gopher burrows are extended year after year and in many cases the tunnels dug by a single gopher in 12 months would measure a mile or more if straightened out and placed end to end The tunnels are full of crooks and turns caused by going around stones or following leads of soft earth

The so-called striped gopher of the Central States is really a ground squirrel but it is no less troublesome Natural enemies of these pests are the weasel and the gopher-snake Farmers also try to keep their numbers down by traps and poison

Pocket gophers are a large family the United States having three genera with 78 species and subspecies which vary widely in size and color Scientific name of the prairie pocket gopher *Geomys bursarius*

GORDON GEN CHARLES GEORGE (1833 1885) Chinese Gordon as he was commonly called was a British officer whose love of danger combined with a religious enthusiasm which verged on Oriental fatalism crowded his career with romantic adventures One of the secrets of the extraordinary deeds he accomplished was his genius for leadership especially among non European peoples

He was the son of a British general was educated at the Royal Military Academy at Woolwich and began his career in the British army in 1852 with a lieutenant's commission He served with conspicuous gallantry in the Crimean War and afterwards in Asia At the age of 30 we find him commander of the Ever Victorious Army of China putting down the Taiping rebels who sought to drive out the unprogressive Manchus and to establish the reign of eternal peace In 1864 within 18 months after Gordon had taken command the ten year-old rebellion which had cost millions of lives was relentlessly suppressed The grateful Chinese thereupon conferred on Gordon the yellow jacket and the peacock feather of a mandarin

The next nine years of his life were spent in the more prosaic but perhaps more useful work of constructing forts in England and serving on various international commissions Then in 1873 he accepted service under the Khedive of Egypt as governor of the Egyptian equatorial province For seven years he labored to establish law and order but his work was not very successful

In 1884 four years after he resigned this commission he was sent back to the Sudan by the British government His commission was to bring out of the region the Egyptian garrisons endangered by the revolt of the Mahdi or Prophet a religious leader whose aim was not unlike that of the Taiping rebels in China But in disregard of his orders General Gordon sought to hold the district and was besieged in the city of Khartum For ten months the city held out when it finally fell (Jan 26 1885) two days before a British relief expedition reached it the whole garrison including its brave but erratic commander was massacred

The death of Gordon raised a storm of indignation in England against the slowness of the government in sending aid Gladstone then prime minister pointed out that Gordon had disobeyed his orders in not leaving the Sudan when he could but public opinion could not forget his chivalrous heroism and regarded him as a martyr So he was —to his own head strongness and the spirit of imperialism which however did not rule the councils of the Liberal government then at the helm in England Tennyson wrote the epitaph for Gordon's memorial in Westminster Abbey



CHARLES GEORGE GORDON
One of England's Warrior Heroes

ONE OF AMERICA'S GREATEST CONQUERORS

The Man who Vanquished the Deadly Mosquito

GORGAS, GEN. WILLIAM CRAWFORD (1854–1920). It is a great thing to uphold the honor of one's country on the battlefield, especially when the conflict is in defense of liberty, of justice, of the rights of men peaceably to rule their affairs. But there are conquests even greater than those over hostile armies—such are the conquests over the forces of disease and death and the suffering of little children. And so we may truly say that one of the greatest conquerors that America ever produced, a man worthy to rank with Washington or Grant or Pershing, was an army officer who only late in life rose above the rank of colonel; who conquered malaria and the deadly yellow fever in Cuba and the Panama Canal Zone and thus made possible the construction of the Panama Canal; and who at his death was recognized as the world's foremost sanitary engineer.



WILLIAM CRAWFORD GORGAS

Gorgas was born near Mobile, Ala., of a family well known in the state. His mother, Amelia, was a daughter of Judge John Gayle, a former governor of Alabama. Gorgas' father, Josiah, became a general in the Confederate army and the collapse of the Southern cause brought the family a full share of hardships. "I first came to Baltimore," said the son, at one time, "about 45 years ago—a ragged, barefoot little rebel, with empty pockets and still more empty stomach. My father had gone south with Lee's army. At the fall and destruction of Richmond, my mother's house, with all that she had, was burned, leaving her stranded with six small children. She came to Baltimore, and was there cared for by friends. These memories are vivid with me, and can never be effaced."

Young Gorgas received his education at the University of the South at Sewanee, Tenn., of which his father had become president. After graduating from Bellevue Medical College, New York, he entered the United States Army as a surgeon, and while stationed at Fort Brown, Tex., had his interest first aroused in the terrible scourge—yellow fever—which he was later to do so much to combat and conquer.

Dr. Gorgas in the Spanish-American War

During the Spanish-American War Dr. Gorgas served as chief sanitary officer of Havana, Cuba, which for years had been notorious as a center of yellow fever. There he won his first world fame by ridding the city almost entirely of this plague. He was practically the first to apply the new discoveries—that both malaria and yellow fever can be spread by the bites of certain species of mosquitoes, which in turn have become infected by biting persons infected with these diseases (*see* Mosquito).

In reward for his work at Havana Dr. Gorgas was created colonel by special act of Congress, and shortly afterward was appointed as chief sanitary officer of the proposed Panama Canal.

The story of the great work which he did there is told more fully elsewhere (*see* Panama Canal). Colonel Gorgas and his men worked especially in four great ways: They destroyed the homes of mosquitoes during the larval stage within a hundred yards of all human dwellings; they destroyed all protection for adult mosquitoes; they screened all houses with wire screens; and they destroyed all breeding-places, either by draining stagnant waters dry or sealing them with crude petroleum, which spreads a film over the surface and kills the larvae.

The War against the Death-bearing Mosquito

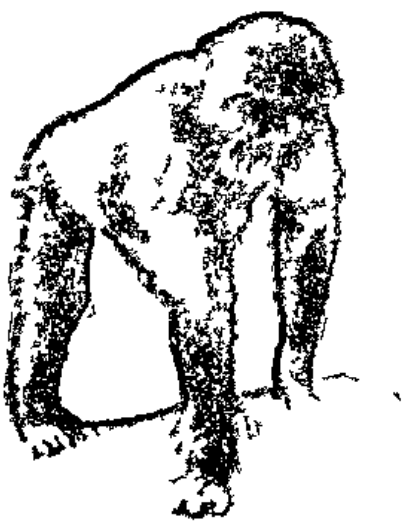
Never was there known so great a "pouring of oil upon troubled waters"; never was there known so strange a fight between an army of hundreds on one side and hundreds of millions on the other. On one side were a few hundred men—doctors and ditchers, drainers and dispensers, oilers and clerks and sanitary inspectors—guarding 40,000 or 50,000 laborers and their families, scattered over 450 square miles in about 40 camps and villages. They were doing the biggest piece of engineering that has ever been done on the earth, digging a way from sea to sea, cutting up a mountain for the sea to pass through, and building huge walls to hold in the sea as it passed. On the other side were the mosquitoes. They rose by millions from waters that were dark and still, and they filled the air with a ceaseless hum. They flew into every open door and window in their hungry search. The deadly effect of their bites was to poison the life-blood of all Panama, as their ancestors had poisoned it for ages with yellow fever and malaria.

Without the remarkable work of Colonel Gorgas in stamping out these diseases, the canal might never have been completed, certainly not without appalling loss of life. It has been estimated that in the ten years that the canal was building he saved more than 70,000 lives, and $80,000,000. His achievement marked an epoch in the history of sanitation, and in the work of making the tropics habitable for the white man. It was not too much now to expect, as Colonel Gorgas prophesied, that "some day a case of yellow fever will be regarded as a medical curiosity."

When the canal was finished in 1914 Colonel Gorgas was promoted to be surgeon general of the United States Army and the next year he was made major general In 1920, while on his way to study yellow fever in Africa for the British government, he died in London His body was brought to the United States for burial in Arlington National Cemetery

GORILLA Largest of all the manlike apes is the gorilla, a native of the dense forests of equatorial Africa Ever since the first explorers penetrated the African jungles this animal has been a pet subject for terrifying stories most of them far from the truth Though extremely powerful the gorilla is not as monstrous or ferocious as is commonly believed When walking erect which he rarely does, the average gorilla has a height of only about five and one half feet yet he would weigh 350 pounds His legs are short his arms long and his heavy, broad-shouldered body is covered with long dark hair which turns gray in old age The gorilla can walk or run on all fours but does so on the knuckles of his hands He can climb trees with more agility than a man It is the face of the gorilla that is so terrifying With black, nearly bare skin, deep-set eyes rimmed with bushy brows a flat nose, and protruding jaws, the gorilla's features are indeed ugly Unless cornered, he will not attack, but when excited he thumps his chest with both fists and breaks out into wild roars

A BABY GORILLA



Not an unpleasant face—do you think—for a gorilla? But he's only a baby Later he will develop tusklike teeth and a ferocious scowl

Gorillas roam about in small family groups, feeding on the shoots of bamboo wild celery, and other tender plants They sleep on the ground or sometimes in trees but have no permanent abode A preserve for gorillas the *Parc National Albert* in the Belgian Congo, was established in 1925 and now has an area of more than 3 000 square miles (*See* Ape)

GOTHS First of the northern barbarians whose successive assaults brought low the *might* of Rome were the Visigoths or West Goths Where the Goths first came from is not definitely known *There were* stories told by their old men of a time when their people had dwelt far to the north on the *shores and* islands of what is now Sweden Then had come long slow wanderings, through the forests of western Russia, until they reached the shores of the Black Sea In a hundred years of contact with the *Romans they* learned many things, especially the Christian religion

This was spread among them by *the efforts of a* convert of their own race a saintly *man named* Ulfilas For more than 40 years he labored first making a Gothic alphabet into which to translate the Bible and then teaching his people the new faith. This Bible translated by Ulfilas is centuries older than *the earliest* writing which we have in any other Teutonic language, so its historical value is very great

For a time the Goths ruled a *great kingdom north* of the Danube River and the Black Sea Then the Huns swept into Europe *from Asia, in 375 A D* conquering the Ostrogoths or East Goths and forcing the Visigoths to seek refuge *across the Danube* within the boundaries of the Roman Empire In a battle fought near the city of Adrianople in 378 *the Visi* goths defeated and slew the Emperor Valens For a time they lived peaceably on Roman territory, *then*, on the death of the Emperor Theodosius in 395, they rose in rebellion under their ambitious *young king* Alaric and overran a large part of the Eastern Empire Rome itself fell into the hands of the impetuous Goths in 410 (*see* Alaric)

Alaric's successors led their people out of Italy and set *up a* powerful kingdom in southern Gaul and Spain In *the year* 507, the Visigoths in Gaul were defeated by the Franks and were forced beyond the Pyrenees For 200 years their kingdom in Spain flourished It did not come to an end until 711, when the Moors crossed over from Africa and in a terrible eight day battle destroyed the Visigothic kingdom (*See* Spain)

The Ostrogoths for a time formed part of the vast horde which followed the king of the Huns Attila settling in the lands south of Vienna when the Hunnish kingdom fell apart Their national hero was Theodoric the Great a powerful and romantic figure who became king in 474 When a boy he had been sent as a hostage to Constantinople and had there been educated In 488 he invaded Italy, with the permission of the emperor at Constantinople After several years of warfare Theodoric captured and slew Odoacer, a barbarian who had there usurped the Roman power and founded a powerful kingdom which included all Italy together with lands north and east of the Adriatic Sea His reign was one of the ablest and best in this period and his kingdom was one of the great "might-have-beens" of history He failed largely because no permanent fusion was effected between the barbarians and the Christian-Roman population All his wise plans for bringing this about proved futile because the Ostrogoths, in common with most of the German barbarians, had been converted to Arianism, an heretical form of Christianity, and so were hated by the orthodox

After Theodoric died in 526, the generals of the Eastern Roman Empire reconquered Italy (*see* Justinian I). After fighting a last battle near Mount Vesuvius in 553, the Ostrogoths marched out of Italy. They merged with other barbarian hordes north of the Alps and disappeared as a nation from history.

GOUNOD (*gō-nō'*), CHARLES FRANÇOIS (1818–1893). Most music lovers know the work of Charles Gounod. His famous opera 'Faust' is presented throughout the world. Some of his sacred music is performed in Christian churches everywhere.

CHARLES GOUNOD



Gounod composed beautiful music for both opera and church.

Gounod was born in Paris on June 17, 1818. The boy inherited musical talent from his mother, an accomplished pianist. After her husband's early death in 1823, she taught music to support the family. She gave Charles his first music lessons.

When he was 11 years old, Charles won a scholarship to the Lycée St. Louis, a Paris boarding school. He worked hard at his studies, but he found time to write little tunes in his schoolbooks. His mother objected to his interest in music as a career at first, then allowed him to study composition on his free Sunday afternoons.

Gounod entered the Paris Conservatory in 1836, and three years later won the Prix de Rome scholarship. At the French Academy in Rome he studied church music, particularly Palestrina and Bach. On his return to Paris he became organist and choirmaster of the Église des Missions Étrangères (Church of the Foreign Missions). As a young man he was handsome, serious, and very quiet. He studied theology, and for a time considered becoming a priest. But in 1848 he left his church post to compose music for the stage.

His first opera, 'Sapho', was a failure, but it brought his name before the critics. His next two also failed. In 1852 he became director of Orphéon, a union of Paris choral societies. The same year he married Anna Zimmermann. They had two children.

Gounod had thought of writing an opera based on Goethe's 'Faust' during his student days (*see* Faust Legends). When he was 40 years old, he fulfilled this ambition. The work was performed at the Théâtre Lyrique in Paris on March 19, 1859. The French did not acclaim it at first, but it became instantly popular elsewhere in Europe. Two later operas, 'Mireille' (1864) and 'Roméo et Juliette' (1867), were only moderately successful.

In 1870 Gounod became head of the British Royal Choral Society. He was sick and unhappy in England and after five years returned to Paris. His last years were devoted to sacred music. He wrote two great oratorios 'La Rédemption' (1882) and 'Mors et Vita' (Death and Life, written 1885). His most famous religious work is the 'Ave Maria' (Hail Mary) based on Bach's 'First Prelude in C Major'. Gounod died Oct. 18, 1893, at St Cloud, France.

GOURDS. *Today gourd vines are grown in back yards or on farms as ornaments or screens. The vine produces a thick mass of downy leaves. Gourds bloom in early summer and produce either yellow or white blossoms, depending on the variety. But gourd vines were useful as well as ornamental to the settlers of pioneer days and to primitive peoples of all times.* In the late summer the many-shaped, hard-skinned fruits appear. These can be used to make dippers or bottles.

The various kinds of gourd vines produce gourds of many strange shapes and lengths, from a few inches to several feet. The gourd called "vegetable sponge" or "dishcloth" (*Luffa cylindrica*) has a fibrous interior. This can be dried and used as a vegetable sponge.

Gourds belong to the family *Cucurbitaceae*. Other members of the family are pumpkins, squashes, and melons. Most pumpkins and squashes have yellow blossoms. In Europe, the flowers as well as the fruits are cooked and eaten as vegetables. The plants commonly used for ornament in the United States are varieties of the white-flowered, bottle gourds or the calabash gourd (*Lagenaria siceraria*) and the yellow-flowered gourd (*Cucurbita Pepo var. ovifera*).

FAMILY *to* NATION—*The Story of* GOVERNMENT

GOVERNMENT. The dictionary gives many meanings for the words "govern" and "government." But most people think first of one kind of activity—making rules and providing services that help people to live together safely and conveniently.

Almost anything any group of people does must be governed by some sort of rules. Their activity may also need help to make the rules work. Two teams would have a hard time playing baseball unless they had rules for the game and an umpire to enforce the rules. A playing field and equipment must also be provided. In order to live together, even the members of a family must observe rules, such as coming to meals at certain times. And the parents must provide help, such as a place to live, food, and clothes.

The people of a town or city need many rules. Nobody can drive an automobile with any safety unless every driver stays on his own side of the road. Stop signs or stop-and-go lights at busy street intersections help enforce the rules.

The community needs police and fire protection, schools, and many other services. It needs officials and employees to provide these services. To pay for everything, it must collect taxes or other revenue. Finally, it must have rules to say how things shall be done; and the officials and police enforce the rules.

Throughout the world large numbers of communities and the countryside between are bound together in organizations called *states* or *nations* The rules made by these organizations are called *laws* or *statutes* Thus the word 'government may refer to making and enforcing rules or providing services for any group from a family to a nation For example a golf club may have a board of governors Usually however, the word means governing activities on behalf of a community a state or a nation

Many Kinds of Laws

Some people think that laws are made only to forbid wrongful actions Actually most of them help to promote efficiency or safety or to give service Examples are laws which provide for traffic regulations and for building roads to carry the traffic

Another common mistake is to regard law as omnipotent Some people think that when there is any problem to be met, all you have to do is pass a law *about it Laws may be very helpful in some cases* and in others they may do actual harm Whether a given evil can be remedied by law is frequently a difficult question It will depend upon the nature of the evil and the wisdom of the law Moreover, if the people will not obey the law particularly in a democracy, the law is futile and its failure may weaken respect for other laws Only such laws will be effective, therefore, as have the approval of a substantial majority of the population.

There is also a mistaken notion that law interferes with liberty Unwise laws may destroy liberty, but wise laws that regulate the conduct of each so that one does not interfere with the liberty of others are the real basis of such freedom as we actually enjoy. Were it not for such laws, criminals could take away our property, destroy life burn down homes, and commit other equally atrocious crimes We have the liberty to enjoy our homes and feel secure in our property only because of laws that forbid interference with the freedom of the individual, and that command the general respect which leads to strong enforcement (*See* Law)

How Government Developed

In the early stages of human development, long *before recorded history* began, there was neither state nor government Doubtless it took many thousands *of years for men*, groping their way through *the mental darkness of* savagery to form the idea of a state It is supposed that as the primitive population increased in size group *association* naturally arose, beginning with the family and the tribe (*see* Family)

When men began to domesticate animals and to practise agriculture, they needed larger *organizations. Presently these agricultural* groups developed into city-states Commerce between groups *began to grow* and the groups began to develop *the machinery* of government to deal with the new problems

One of the fundamental elements *in* associated living is the fact that people vary Some are stronger, some wiser, some more honest more skilful, more capable A few are natural leaders, the many are natural followers Out of this difference in capacity and ability grew the social and economic strata of mankind The strong and the clever became a ruling class which furnished chiefs war leaders, priests and kings The least capable of all became slaves Through many centuries the idea persisted that it was the right of some to rule, the duty of the many to be ruled Ruling became hereditary in families and rulers gained absolute power over their "subjects"

Origin of Kings

The first kings usually were successful warriors who had won many battles and captured much land over which they were able to hold sway by force of arms The laws of those early kingdoms were chiefly concerned with raising armies and collecting taxes In Egypt Babylonia, and Assyria, religion was so closely identified with government that laws came to have *a supernatural sanction and a supposedly divine* origin The kings came to be thought of either as lesser gods or as the ambassadors of gods, and the laws which they made were considered sacred

It was not until the time of the Greek city states that government and laws began to assume a different aspect in the eyes of the people About five centuries before the birth of Christ a group of Greek scholars, known as Sophists, taught that "man is the measure of all things" This new doctrine gave rise to the idea that man had a right to determine his own rules of conduct, and that he might inquire into the basis and nature of the government under which he lived, if he found that government to be unsuited to his needs he had the right to change it

Origin and Spread of Democracy

Out of these ideas grew the beginnings of democracy The word "democracy' is a union of two Greek words: *dêmos*, meaning "people," and *kratos*, meaning "rule" Actually, however, only a small part of the people in the Greek city-states enjoyed full rights of citizenship Among the Romans some advances in democratic government were made by granting popular rights and extending the privileges of citizenship But the Romans were a practical people Though they were much interested in conquering and governing, they were not particularly interested in the theory of government It is noteworthy that only a few English words such as *senate*, describing particular organs or officers of government are of Roman origin, almost without exception the words which relate to the theory of government, such as *autocracy* and *democracy*, came from the Greek.

In the centuries immediately preceding the establishment of the empire in 31 B C. Rome, though a republic in name was ruled by an aristocracy, the senate Literally the word *aristocracy* means "rule of the best" The ideal aristocracy comprised men of superior wisdom, who ruled conscientiously in the interests of the people When those in power allowed their own selfish interests to predominate, discontent

arose among the people, and the power of the senate gradually declined until Julius Caesar seized supreme power. His successor, Octavian (Augustus), established the Roman Empire, which was essentially an autocracy, though the forms of the republic remained in existence for some time.

Teutonic Changes in Roman Policies

The tribes of barbarians which overran the Roman Empire in the 4th and 5th centuries of our era did not have a fully developed system of government; but they had one principle which had a great influence on later governmental systems. This was the idea that every man has a certain liberty which no law can take away from him. In other words, they believed that government existed for the benefit of the individual, as against the Roman idea that the individual existed for the benefit of the government. The Teutonic tribes carried their democratic idea of the relationship between the citizen and the government across the sea to England. There it thrived and became the basis of governmental forms which are the foundation of many existing political systems, including the American.

In English history, whenever kings went too far in their opposition to this theory, they were defeated. It was one of the great events in the history of government when, on a memorable June morning in the year 1215, King John of England, surrounded by angry barons, signed the Great Charter (Magna Carta) against his will. This famous document established the individual rights of subjects against kings, a turning point in history. Today Great Britain retains the form of a monarchy, but its spirit and most of its political institutions are those of a democracy.

Chief Types of Government

The authority of a state to rule is its *sovereignty*. In a democracy all the citizens possess an equal share of the sovereignty. Democracy in the United States is associated with the republican form of government and representative democracy. (*See* Democracy.)

In an autocratic form of government, sovereignty belongs to the rulers. If the state is governed by a small ruling class, it is an *oligarchy*. No modern state is governed by an avowed oligarchy, although control of the state by a minority in its own interest is often referred to as oligarchic rule. If the state is governed actually or in theory by a single ruler, the king, it is a *monarchy* (from the Greek word meaning "sole ruler"). A limited monarchy is one in which the ruler's power is limited by the power of the nobles, by a constitution, or in some other way. All existing monarchies are, in theory at least, limited; and in most the king is important chiefly as a symbol of the unity of the state. England, Denmark, and the Netherlands are examples of limited monarchies.

A new form of autocracy, which developed following World War I is the *totalitarian state*. Under the totalitarian system, absolute sovereignty resides in the state, which possesses the power to regulate work, education, science, religion—indeed every phase of the life of the people. The individual has "rights" and liberties only in so far as the state confers them. The totalitarian state tolerates only one political party. Usually it is governed by a *dictator*, who has unlimited power (*see* Dictatorship).

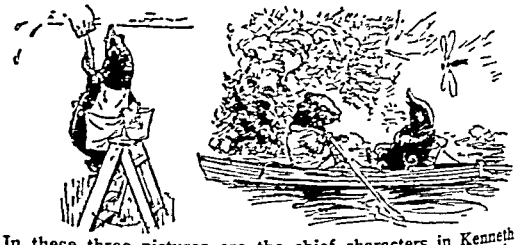
World War II put an end to the totalitarian governments of Germany and Italy (*see* Fascism). After the war, the totalitarian communistic system found in Russia spread over most of eastern Europe and into the Far East. (*See* Communism; Russia.)

Treason and Sedition

Treason is the most serious offense which a citizen can commit against the state. The third section of Article III of the United States Constitution defines treason against the United States as "levying war against them or giving aid and comfort to their enemies." Thus treason in wartime includes any act by a citizen which furthers the hostile designs of the enemy. In time of peace it may be considered treason to attempt to overthrow the government by force or to put up organized resistance against the execution of any law. A citizen who is convicted of treason may be punished by death or by imprisonment and fine. Sedition in modern times is applied to language or conduct which disturbs public order and the tranquility of the state. It differs from treason in that it is not accompanied by any overt act against the state. (For further study, *see* Reference-Outline for Political Science.)

Grahame, Kenneth (1859-1932). When Kenneth Grahame's small son Alastair went on a vacation, he asked his father to continue his bedtime stories by mail. These installments, mailed daily, became the first chapters for one of the best of all children's books, 'The Wind in the Willows'.

YOUR FRIENDS IN THE WILLOWS



In these three pictures are the chief characters in Kenneth Grahame's beloved book, 'The Wind in the Willows'. At left, Mole begins spring cleaning; right, he and Rat are sculling.



Here Toad (center), Rat, and Mole listen to Badger's plan for recapturing Toad's ancestral home from the brigand Weasels.

Kenneth Grahame was born March 8, 1859 in Edinburgh, Scotland For a time the family lived at Ardrishaig a small fishing village where Kenneth came to know boats the sea and the small animals that live near the wharves When he was nine he was sent to St Edward s School at Oxford England In his last term he was captain of the Rugby team and head of the school the highest honor his schoolmates could give him He wanted to attend Oxford University but his parents had died and he had to go to work In 1879 he began as a clerk in the Bank of England

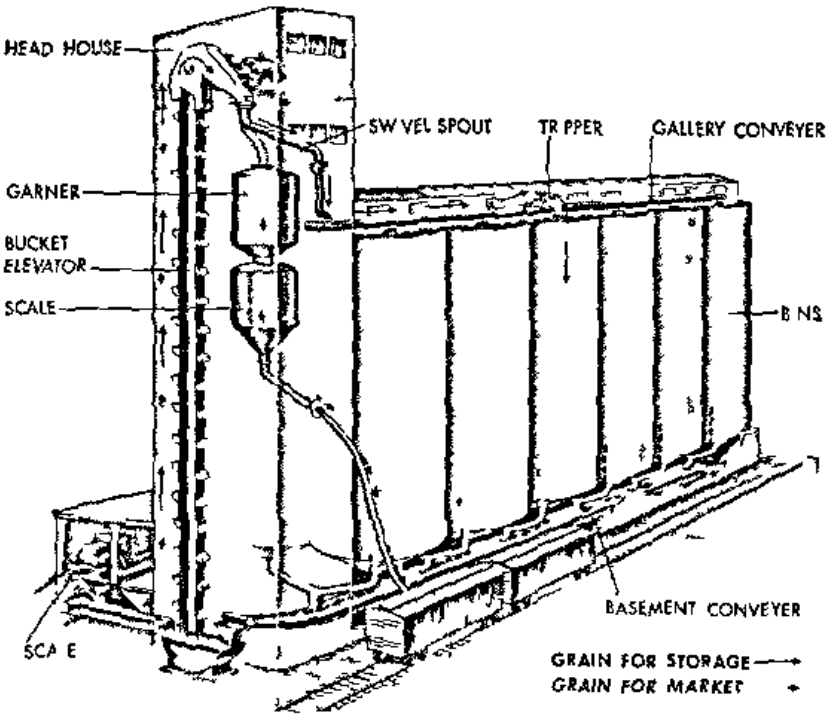
Grahame advanced steadily to become secretary of the bank At the same time he contributed story sketches about children to the *National Observer* and the *Yellow Book* His editors urged him to quit banking for literature but he preferred to write when he chose He called himself a "Sunday writer" working only on week ends His sketches were published in book form as The Golden Age (1895) and Dream Days (1898) They won the praise of critics and such lovers of books as Theodore Roosevelt

In 1899 Grahame married Elspeth Thomson and the next year Alastair their only child was born The Wind in the Willows was published in 1908 Grahame retired from the bank in the same year and lived quietly on his country estate

Through the pages of The Wind in the Willows scamper a delightful group of characters—Toad Mole Badger and Water Rat They are animals but they dress talk and live like human beings Rich Mr Toad master of Toad Hall is the central character He wants Travel! Change! Excitement! And his merry pursuit of these pleasures leads him and his friends into all sorts of adventures

The Wind in the Willows is one of those rare books that can be reread all through life Adults coming upon it for the first time encounter some of the finest writing in the English language and an artistic subtlety of treatment One example is the chapter Wayfarers All in which Water Rat meets Sea Rat and is so excited by the talk of ships and foreign ports that he almost leaves his friends for a life at sea The reader forgetting the animal characters sees Water Rat as a young man yearning for the mystery and adventure of faraway places and for the moment identifies himself with Water Rat in these compelling dreams Grahame s power like Lewis Carroll s lay in his ability to draw great truth from comic characters and absurd situations Even adults thoroughly enjoy The Wind in the Willows

HOW A GRAIN ELEVATOR OPERATES



The truck hauls grain from farm fields to the grain elevator where the bucket elevator carries it to the gallery The tripper distributes it to the storage bins When marketed, the grain is loaded into boxcars by the basement conveyer and the elevator

GRAIN ELEVATORS A farmer in the United States may market his wheat corn oats or other grain by loading it on a truck and hauling it to a grain warehouse called a *country elevator* There he may either sell his crop to the elevator operator or he may store it for future sale

From the country elevator the grain is shipped to the large elevators at the central markets There it is stored until time for shipment to mills or foreign markets These *terminal elevators* are towering steel and concrete structures The world s largest grain elevator at Albany N Y holds about 13 million bushels At the grain elevator the grain may be processed by cleaning drying weighing and bleaching To lessen the danger of dust explosions the dust is collected and removed by suction pumps

The rapid expansion of wheat growing after the Civil War and the lack of storage facilities caused the railroads to build country elevators or to help private concerns construct them They are owned by independent dealers railroads milling companies or by co-operative associations Canada and the United States have many elevators but most grain-exporting countries store and ship grain in sacks The elevator method gives better protection against fire and vermin

GRAMMAR The set of rules for the correct use of words to express thought is called *grammar* These rules have not been laid down by any one person They are the outgrowth of years of use by generations of people They are not artificial Good reason is behind each of them because they enable us to give the clearest meaning to every word

THE EIGHT PARTS OF SPEECH AND WHAT THEY DO

1. **Noun.** This is the "name" word. A noun is used for a person, a thing, a time, a place, or a state of being. ("Happiness," for example, is a "state of being.")

2. **Pronoun.** The word used instead of a noun, usually to avoid repetition. Instead of repeating the noun "Chicago," you can use the pronoun "it"; instead of repeating "Americans," you can use "they."

3. **Verb.** Used to denote action or existence. "Run" is an action verb; "is" and "are" are existence verbs.

4. **Adjective.** The word used to describe a noun. "Man" is a noun. "Good" is an adjective. When put together, they describe a kind of man—a "good man."

5. **Adverb.** A word used to describe a verb, an adjective, preposition, or another adverb. An example of a verb is the word "read", "well" is an adverb, describing the verb "They read well."

6. **Conjunction.** This word is from the Latin, meaning "join together." A conjunction, such as "and," joins words together.

7. **Preposition.** This word is from the Latin, meaning "put before." A preposition, such as the word "in," is put before a noun or pronoun, usually to tell time or place. Examples: "in the morning" and "in the house."

8. **Interjection.** This is a single word usually used to express strong feeling or to command attention. Examples: "Ouch!" and "Help!"

The most common words in the English language are *a, an, the.* They are *articles* and are classed as adjectives.

Grammar makes clear what we say and write and what other people say and write to us. To speak and write grammatically is, moreover, the mark of a well-educated person. Most of us take pride in choosing the right word and using it correctly.

The English language has more than half a million words. This vast number, however, falls into eight general classes—the eight *parts of speech.* They are: *noun, pronoun, verb, adjective, adverb, conjunction, preposition,* and *interjection.* They are shown in the accompanying table and are explained in detail in articles under their own titles in this encyclopedia.

The discussion of grammar in this article is aimed at showing you the general use of these parts of speech so that you may speak and write correctly—and interestingly.

Grammar Enables Us to Communicate Ideas

Far back in the history of man, people communicated their ideas by single words. Today we call such words interjections; and that is how babies speak when they are learning to talk. A baby may bump his head and say, "Hurt!" Unless we saw him bump his head, however, it might be hard to know what he had bumped.

As he learns more he makes his ideas clearer by putting words together. In speaking and writing we usually put words together in a *phrase,* a *clause,* or a *sentence.* A phrase is a group of two or more words that carries meaning, but lacks a subject and predicate—for example, "in glass houses." A clause is a group of words within a sentence, with a subject and predicate, as "who live in glass houses." A sentence is a group of words that tells a complete idea. It usually contains phrases or clauses, or both, as "People who live in glass houses have no right to throw stones" (*see* Sentence).

How We Make a Sentence

When the baby learns to put words together, instead of only saying "Hurt!" he says, "Head hurts." The addition of a *subject,* in this case "head," tells us clearly what hurts. The word "hurts" is the *predicate.*

Every sentence, no matter how short or how involved, must have these two parts—subject and predicate. The subject is the thing we talk about, such as "head." The predicate indicates what is said about it, as when the baby said, "hurts." Notice that, as used here, the word "hurts" is a *verb.* Every predicate must contain a verb. For an example of dividing a longer sentence into subject and predicate, take "The largest city in the United States is New York." Here the subject is not one word, but several—it is, "The largest city in the United States." The predicate is "is New York."

The two sentences studied here are *simple* sentences. A simple sentence is one that tells a single fact, with one subject and one predicate. In the article Sentence you will learn how to make *complex* and *compound* sentences. Despite their names, they do not have to be puzzling or cumbersome. They are well worth studying, because they can give variety and liveliness to your speaking and writing.

In both speaking and writing, the sentence is your chief form of communicating with other people. When written or printed, sentences are easy to recognize, because each starts with a capital letter and ends with a period (.), or an interrogation, or question mark (?), or an exclamation point (!). (*See also* Punctuation.) In spoken English, the type of sentence is indicated by inflecting the voice—an even tone for a declarative, or "period," sentence; rising tone for a "question" sentence; a little burst of extra force for an exclamatory sentence.

When you do not use punctuation in written English, your meaning is seldom clear. Look at these words strung together: "I am going downtown to buy a pair of shoes they will have to be practical my mother says they must last until spring that is months away." They make much more sense when punctuation splits them into correct groups: "I am going downtown to buy a pair of shoes. They will have to be practical. My mother says they must last until spring. That is months away."

Sometimes two or more sentences seem to have equal value. You may say, "I am tired. I stayed up too late." The first, however, is the result of the second and this meaning would be clear if you said, "I am tired because I stayed up too late." What seem to be two sentences are really clauses and are now correctly joined by the conjunction *because.*

Conjunctions also join words and phrases. The conjunction used most is the word *and.* There is danger in that handy but lazy word. People who talk or write carelessly use it too often, hitching all their ideas to

it For example I awakened early and got into my oldest jeans and dug some bait and went fishing and caught eight perch and came home and gave them to mother and she asked me to clean them and she fried them for us and they certainly tasted fresh and crisp Read that aloud and you will probably not only get out of breath but you will also have forgotten some of the ideas

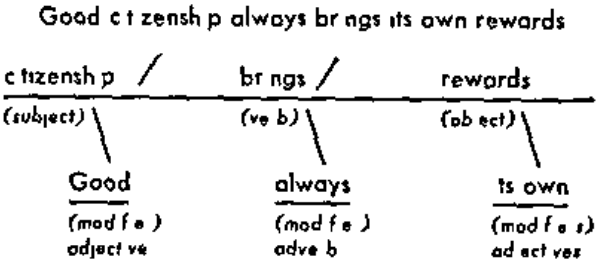
The thought is much clearer and far less monotonous when you break it up and use varied words such as pronouns and adjectives For example I awakened early and after getting into my oldest jeans dug some bait and went fishing I caught eight perch When I came home I gave them to mother who asked me to clean them She then fried them for us They certainly tasted fresh and crisp

Diagraming a Sentence

You can study a sentence by *diagraming* it—that is breaking it into its related parts The example above is a diagram of a simple declarative sentence— Good citizenship brings its own rewards You see how it is broken into subject verb and object with their modifiers which are adjectives and adverbs as labeled Complex and compound sentences can also be diagramed There are many styles in diagraming but each aims to analyze the sentence

Usage Etymology and Syntax

The rules of grammar are as alive as our language itself for they change with usage Shakespeare for example wrote the most unkindest cut of all which is a double superlative To day it is no longer correct On the other hand many of the expressions that were considered ungrammatical only a few years



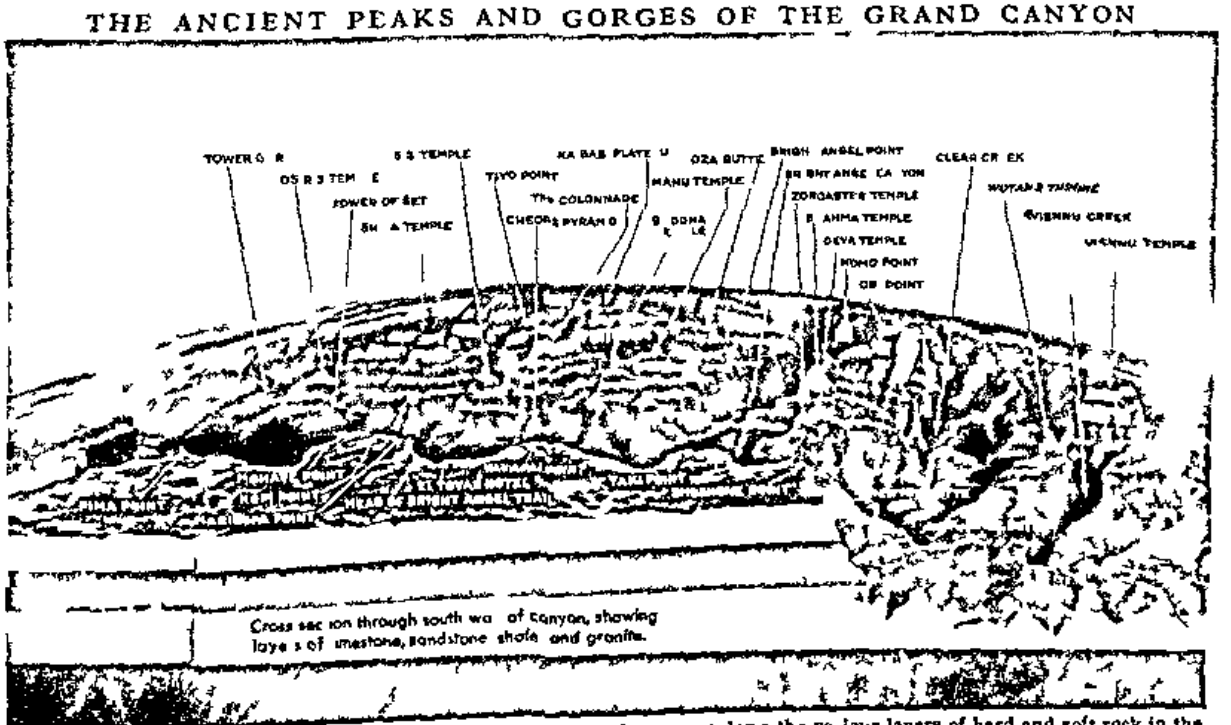
ago are now acceptable to many grammarians because of their wide usage

An example of change in usage is the modern informality in business correspondence The business letter of 1900 began something like this Yours of the 12th instant received and its contents duly noted Today such stiff formality is outdated Informality has also increased in conversation reports the theater literature and on radio and television Such formal expressions as I am and you do not are often contracted to I'm and you don't

The science of grammar comprises two large divisions—*etymology* and *syntax* Etymology which comes from the Greek *etymos* (true) is the study of words especially their derivation Syntax from the Greek *syntaxis* (put in order) is the study of sentence structure (*See also* Language Arts Spelling)

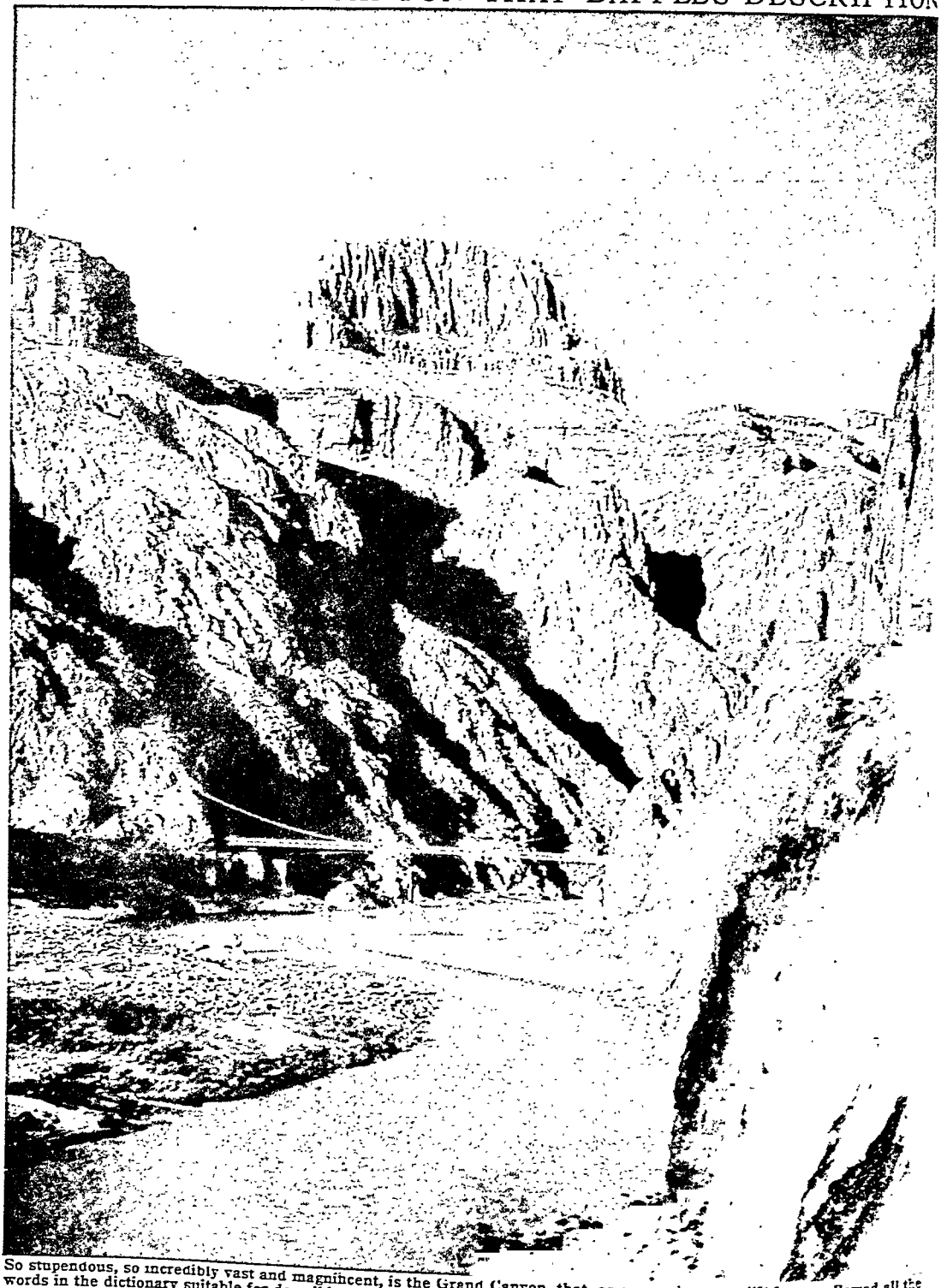
GRAND CANYON When you stand on the rim of the 217 mile gorge cut by the Colorado River through the high plateau of northern Arizona you are overwhelmed with awe The Grand Canyon of the Colorado is the most spectacular canyon in the world It is nature's greatest example of sculpturing

THE ANCIENT PEAKS AND GORGES OF THE GRAND CANYON



This model shows in one full sweep one of nature's greatest wonders of the world The Colorado River rains and the wind have worn down the various layers of hard and soft rock in the high tableland of America's Southwest into striking sculptures

THE STUPENDOUS CANYON THAT BAFFLES DESCRIPTION



So stupendous, so incredibly vast and magnificent, is the Grand Canyon, that, as one writer says, "It has swallowed all the words in the dictionary suitable for describing the impression it makes on the eye, and it still remains undescribed." Here we see how the tributaries of the Colorado have cut up the original mass into the "temples" and buttes. Some ledges are red, some yellow, some gray. Purples and blues and greens appear in certain lights. The effect is like a great broken rainbow.

Look across the yawning depths of the stupendous chasm to the opposite wall ablaze with bands of glowing colors Peer over the edge and far below you see what appears to be a tiny silver thread it is the swift-flowing Colorado, one of the large rivers of North America It looks so small because it is a mile below you. At the top its canyon is 4 to 18 miles wide

From the rim to the river s brink the walls descend in a succession of cliffs and terraces like a giant s staircase each step several hundred feet high The barren rocks of white buff dull red and green have been carved into a bewildering variety of forms—buttes and pinnacles alcoves and Oriental temples crowned by battlements

The majesty of the Grand Canyon which Charles Dudley Warner called by far the most sublime of all earthly spectacles is accentuated by a myriad of s de gorges which join the main canyon from right and left The region is a composite of hundreds and thousands of gorges Few have seen more than a tiny fraction of its wonders for the journey through the length of the gorge is made extremely hazardous by the many rapids in some of which the stream attains a velocity of 25 miles an hour The first man to go through the canyon was Major J W Powell (1869) later Director of the United States Geologi al Survey, whose fascinating narrative of l is explora tions remains one of the classics of American travel

Even the hardiest frontiersmen shunned the un known perils of engulfing whirlpools underground passages and giant falls which Indian legend attri buted to the canyon until Major Powell organized a party of ten to thread the gorge from end to end Hazardous enough the adventure proved though the underground channels and giant falls were found to be myths On the very day the journey ended just before Major Powell and the faithful few of his band emerge l into safety four men deserted hoping to scale the walls and were never heard from again

A reservation of 1 008 square miles along the rim of the Grand Canyon was set aside by the United States government in 1919 as one of the national parks In 1932 an additional 306 square m les on the down stream side of the park were made a national monu ment A railroad spur and motor highways reach the canyon (For illustrations in color *see* National Parks)

GRAND RAPIDS, MICH When an American thinks of furniture he thinks of Grand Rap ds the furniture capital of the United States About 80 furniture factories are located there and the annual output is enormous While New York and Chicago exceed Grand Rapids in the volume of production of furni ture Grand Rapids is regarded as the leader in de ign finish and quality

Twice a year furniture buyers from all parts of the United States and even from abroad come to this city to inspect new styles and place orders These ev ents have become so important that manufacturers from oth er cities also send their products to be displayed in huge expos tion buildings erected for their use

Bes des furniture making Grand Rapids has other important industries Its factories produce automo b le bodies and parts refrigerator cabinets school theater and church seats hardware plaster and other gypsum products baking and food products packed meat flour and soft drinks paper products and elec tronic devices It also has printing plants

Grand Rapids is the largest trading center of west-ern Michigan and the second largest city in the state It is s tuated on the Grand River about 35 miles east of Lake Michigan and near the center of the famous M chigan fruit belt and lake resort region

The city has followed a definite plan of development and is very attractive Its parks and playgrounds cover more than 1 000 acres It is the seat of Aquinas and Calvin colleges Grand Rapids Junior College and a branch of the University of Michigan Its unique and outstand ng Furniture Museum l as a fine collect on of h tonic and current pieces

In 1826 Lou s Campau a trader became the first permanent white settler on t l e site of what is now Grand Rap ds In 1833 Samuel Dexter brought the first organized group of settlers from Herkimer County N Y The city was incorporated in 1850 It has a council manager form of government Pop ula-tion (1950 census) 176 515

GRANITE. If you crush a piece of granite to powder, you can eas ly p ck out tiny fragments of the separate substances or minerals that compose it One mineral is *quartz* The particles often resemble smoky glass Another is *feldspar* You also see *mica* whose thin flat part cles reflect light like tiny mirrors (*See also* Feldspar Mica Quartz)

The color of granite depends on the proport ons and varieties of the minerals present The preval ng color is gray It is dark gray if dark minerals are abundant and light if they are few Greenish pink and blue hues are due to different kinds of feldspar

Granite is an igneous rock It was formed ages ago wl en *magma* (molten rock) cooled This cooling took place below the earth s surface and slowly enough to permit formation of crystals It has been formed in all the periods of geological time It com monly occurs in mountain ranges having been formed as mountain ores But it also occurs in level regions which were mountainous at one time but have since been worn down (*see also* Rock)

Fresh granite is a very hard stone but like other rocks it may decay and crumble to pieces Because of its great hardness it is difficult to work and so is an expensive building stone It is used ch efly as di mension stone for paving blocks curbing monuments an l large buildings where great strength durab lity and beauty of finish are requ red Many var eties are very beautiful in color ng and take a h gh polish

The principal producing states of gran te used for dimension stone are Vermont Massachusetts Geor-gia So th Dakota and Minnesota Other leading producers include Ma ne Wisconsin North Carolina Oklahon a and South Carol na (*See* Q tarry ing)

The HERO *of* APPOMATTOX *in* WAR *and in* PEACE

GRANT, GEN. ULYSSES S. (1822–1885). When the news that Fort Sumter had been fired on was flashed over the wires in April 1861, meetings were held in every city and village in the North, and volunteers by thousands offered their services in defense of the Union, even before President Lincoln issued his first call for troops. At a meeting in Galena, Ill., a middle-aged clerk in the hardware and leather store of Jesse Grant came forward and offered to help recruit a regiment. This man was Ulysses S. Grant, a graduate of West Point, who had served with distinction in the Mexican War and had resigned from the regular army with the rank of captain.



ULYSSES S. GRANT

Born on April 27, 1822, in a little town, Point Pleasant, Ohio, the boy was named Hiram Ulysses. An error in his papers when he entered West Point Military Academy in 1839 dropped the Hiram and inserted Simpson, his mother's maiden name. He reported the error, but it was never corrected, and eventually he adopted the name as changed. But his son, U. S. Grant, Jr., reports that the "S" was always written without a period, and that while it may have meant "Simpson," it was never so written.

Upon his graduation in 1843, Lieutenant Grant was sent to Jefferson Barracks, Mo., and thence to the Mexican War, where he won two brevets for bravery. In 1848 he married Julia B. Dent, the sister of a classmate, in St. Louis, and saw several years' service in the Far West in pioneer days. In 1854 he resigned and retired to a farm near St. Louis, later opening a real-estate office in the city. But in business Grant was a failure. He got into debt, and was glad to take a place as clerk in his father's store in Galena.

A Man of the Bull-Dog Breed

In May 1861, Grant was appointed colonel of the 21st Illinois Infantry, and in August he was made brigadier general of volunteers and given command of southwestern Missouri, with headquarters at Cairo. From the start Grant's policy showed the aggressiveness which marked his whole career. He at once took possession of Paducah, Ky. On November 1 he routed the Confederate garrison at Belmont, Mo., a result which checked the advance of a Confederate force under General Price. In February 1862, he captured Fort Henry on the Tennessee and Fort Donelson on the Cumberland. While he was besieging the latter, the commander of the fort, General Buckner, asked for terms of capitulation, to which General Grant replied: "No terms other than an unconditional and immediate surrender can be accepted." Buckner surrendered the fort with over 14,000 prisoners, and Grant became famous as "Unconditional Surrender" Grant. This important victory broke the Confederate lines, and secured Federal control of western Kentucky and Tennessee.

Grant was now made major-general of volunteers and given command of western Tennessee. On April 6, he fought the battle of Shiloh, one of the bloodiest engagements of the war. He was severely blamed by the people of the North for the heavy loss of life in this battle, and many demanded his removal from command. But President Lincoln steadily upheld him, saying, "I can't spare this man, he fights." During the summer he fought the minor battles of Iuka and Corinth, in Mississippi.

The Fall of Vicksburg

He then turned to the capture of Vicksburg, which would open the Mississippi River. His first advance on the city, poorly planned and complicated by political intrigues, proved a failure. But Grant remained in the neighborhood with his army, and after trying one plan after another without result, his perseverance was at length rewarded. After a daring campaign, in which his generalship and his energy were more conspicuous than ever, he besieged the city. At the end of six weeks of blockade and heavy bombardment, this stronghold, with its garrison of 32,000 men, was forced to surrender on July 4, 1863 (*see* Vicksburg, Battle of).

Grant's next campaign was for the relief of Chattanooga, where the Federal army, beaten at Chickamauga, was besieged and practically cut off from supplies. On November 23 to 25 the battles of Lookout Mountain and Missionary Ridge were fought, resulting in the defeat of the Confederates.

Takes Command of All Union Armies

In March 1864 Grant was made lieutenant general and placed in command of all the Union armies. He now planned a wide campaign which should press the Confederates simultaneously at all points east and west. Leaving Sherman to fight Johnston from Chattanooga to Atlanta, he himself with the Army of the Potomac confronted the Confederates under General Lee. The clash of these great leaders came in the terrible battles of the Wilderness, Spottsylvania, North Anna, and Cold Harbor. Finally came the siege of Petersburg, which ended in its fall, the capture of Richmond, and the surrender of Lee at Appomat-

tox, April 9, 1865 Grant s generous terms of surrender and his courteous treatment of his late foe won the heart of the South At a later time he even threatened to resign his command if President Johnson had Lee tried for treason

The war was over Grant went immediately to Washington to hasten the disbanding of the army He was made a full general, the first to hold this rank in the United States Army, and was hailed as 'the man of destiny" and 'the nation's deliverer ' As such, he was elected president in 1868 on the Republican ticket, with Schuyler Colfax of Indiana as vice presidential candidate, against Gov Horatio Seymour of New York the Democratic candidate

"The man on horseback" is not always a successful executive General Grant's inexperience in civil administration was conceded and his lack of political ability was soon to be shown But his strong will was known and also his rugged patriotism He possessed the confidence of the people and this was increased by the negotiation of the Washington treaty *with England*, which defined the rights and *duties* of neutral nations in time of war and arranged the arbitration of the *Alabama* claims His attempts *failed*, however, to bring about the annexation of the Dominican Republic to the United States

The most important domestic problem of Grant s administration was the completion of the reconstruction of the South and the adoption of the 15th amendment

In 1872 President Grant was overwhelmingly reelected, with Henry Wilson of Massachusetts as his running mate in spite of the opposition candidacy of Horace Greeley, the noted editor of the New York *Tribune*, who ran on a Liberal Republican platform At the beginning of his second administration Grant had to face the financial crisis of '73 Here he rendered an inestimable service to the country by vetoing a bill for issuing more "greenback ' paper money, and by recommending that the government "resume specie payments ' by redeeming its greenbacks in gold The coinage bill passed the same year was later denounced as the "crime of 1873," because, by dropping the silver dollar from the list of standard silver coins, it "demonetized silver" His policy, however, was unquestionably in line with the best interests of the country.

GRANT S ADMINISTRATIONS
1869–1877

Treaty to annex Dominican Republic defeated (1869)
15th Amendment ratified (1870)
Last of seceded states restored (1870)
'Alabama' Claims referred to arbitration (1871)
Amnesty Act for ex-Confederates passed (1872)
Great fires in Chicago (1871) and Boston (1872).
Panic of 1873.
Bill to increase paper money vetoed (1873)
"Salary Grab" raises Congressmen's salaries (1873)
Postal cards first issued (1873)
"Whisky Ring" scandal exposed (1874)
Custer Indian Massacre (1876).
Colorado admitted (1876)
Centennial Exposition at Philadelphia (1876)
Disputed Hayes–Tilden Election of 1876

The last years of Grant's presidency covered the lowest ebb ever reached in the political life of the country High public officials allowed contractors to cheat the government out of millions of dollars and profited by bribes Scandals grew out of government aid to the Union Pacific Railway, and the phrases "credit mobilier," "whiskey ring ' and 'star route" became synonyms for dishonesty In all the political corruption however no one accused Grant of personal dishonesty His fault lay in trusting those unworthy of trust and in trying to protect his friends He was succeeded as president in 1877 by Rutherford B Hayes who had beaten the Democratic candidate, Samuel J Tilden in a disputed election in 1876 (*see* Hayes)

In 1877 after his retirement from the presidency Grant made his famous tour of the world in which Occident and Orient competed to do him honor The attempt to secure for Grant the Republican nomination in 1880 for a third term failed in spite of strenuous efforts put forth by the 'stalwart' Republicans

At the age of 56, a man of established fame Grant invested his capital in the banking firm of Grant and Ward, New York City With his usual trust in his associates and his ignorance of business, General Grant left the conduct of the enterprise to his partners, who proved dishonest Through their dishonesty the firm failed, and Grant was left penniless A fall had crippled him, so that, at this time and until his death, he had to use a crutch

Nothing in all Grant s career was so heroic as the last year of his life Bankrupt, crippled and dying of cancer of the tongue he dictated two volumes of 'Memoirs' to provide for his family Even though it was utter agony to speak, he continued his task That courage and tenacity recalled his famous dispatch sent May 11, 1864 in the battle of Spotsylvania Court House—'I purpose to fight it out on this line if it takes all summer" As then, Grant 'held to the line" until he finished his book, only four days before he died at Mt McGregor, near Saratoga Springs, N Y , July 23 1885 The 'Memoirs were a great financial success and their straightforward clear style gives them literary merit

The magnificent tomb erected to Grant s memory in Riverside Park, New York City, is the tribute of a grateful nation It honors him as the man whose military victories were the key to preserving the Union

GRAPEFRUIT. Until late in the 19th century the few people in the United States who had grapefruit trees grew them only as ornaments. They let the handsome yellow ripe fruit fall to the ground and rot. Today grapefruit, or its refreshing juice, is served throughout the world—from breakfasts to banquets.

Raising and processing grapefruit is a huge industry in southern Florida, Arizona, and the Rio Grande valley of Texas. Southern California also has many groves of this popular citrus fruit. The United States is the world's largest producer. Other large growers are Puerto Rico, Cuba, Jamaica, Mexico, Brazil, South Africa, and Israel.

Grapefruit (also called pomelo) is so named because the fruit grows in grapelike clusters of from 3 to 18. The popular varieties are about twice the size of a large orange. The tree can rise to about 50 feet, but in groves it is topped at 15 to 25 feet and usually has three or four main limbs. The dark, glossy leaves are downy white beneath, and the large blossoms are sweet-scented (for illustration in color, *see* Fruit). Grapefruit trees are usually started by grafting budwood on sour-orange stock.

The trees bear in six or seven years. Some mature trees, such as Thompson pinks, may yield 1,500 pounds of fruit a season, but the average is 300 pounds. Trees begin blossoming from February to May, ripening in about eight months. In Florida, grapefruit must pass state maturity tests before shipment, which begins about October 15. Early season "matures" with greenish rinds are gassed to bring out the yellow color. Popular early varieties are Duncan and Foster; midseason, Royal; late, Marsh seedless and Thompson pinks. The pink-fleshed grapefruit was accidentally discovered in 1913 as a sport of the Marsh seedless. Selective breeding developed it for market by 1937.

Grapefruit is eaten raw or broiled. Great quantities are peeled, the segments being canned for salads and appetizers. The juice is canned or frozen; and rind, seeds, and "rag" (the core and fibrous tissue between segments) are ground for animal feed or pressed into flavoring oil, largely for soft drinks. Grapefruit has few calories and much vitamin C.

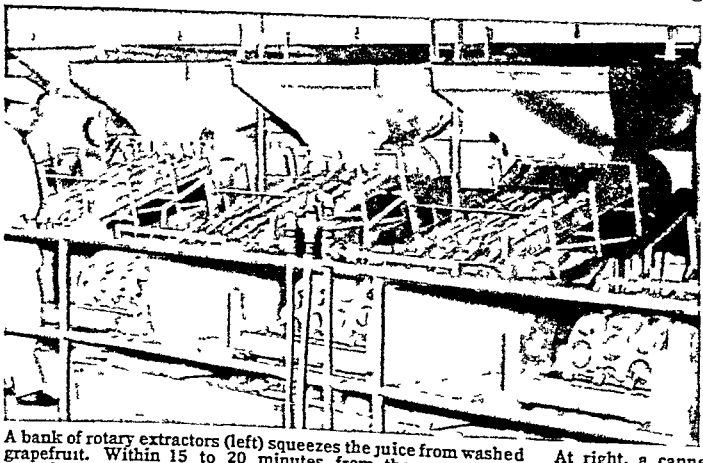
Horticulturists long thought that grapefruit was of the same species of the citrus family as the shaddock (or pummelo), a native of Malaya and the South Sea islands. The shaddock is a coarse, bitter, pear-shaped fruit, weighing from 10 to 20 pounds, supposedly brought to the West Indies by a sea captain named Shaddock. Now authorities say grapefruit is a distinct species, *Citrus paradisi*, probably developed as a seedling sport in the West Indies.

It was probably introduced into Florida about 1809. Late in the 19th century winter visitors tried the fruit and liked it so much that Floridans planted groves and began northern shipments in the 1880's.

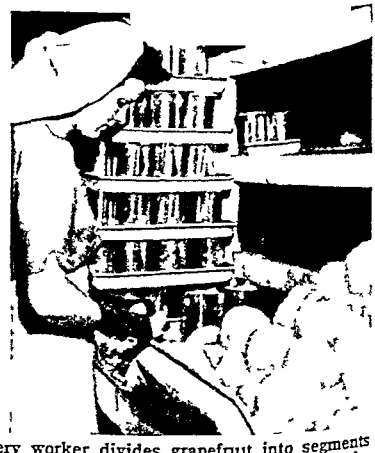
ON THEIR WAY TO YOUR TABLE



Grapefruit is picked by hand in even the largest groves, for it must be handled gently to avoid bruises and scratches.

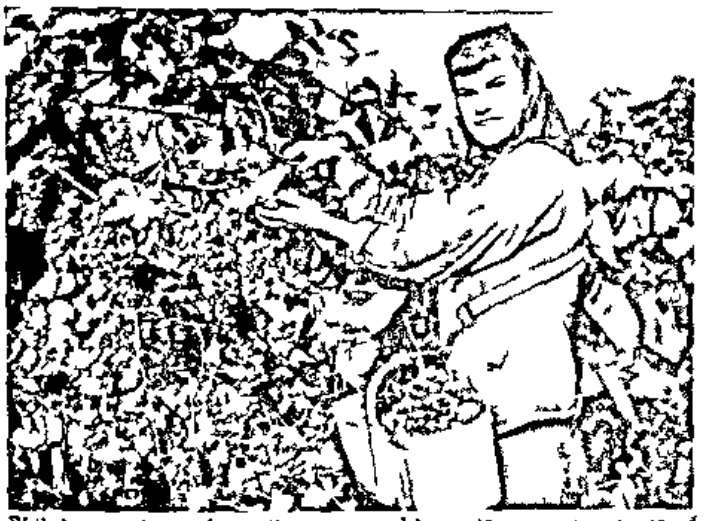


A bank of rotary extractors (left) squeezes the juice from washed grapefruit. Within 15 to 20 minutes from the moment the grapefruit is unloaded from the truck, the juice is in cans.



At right, a cannery worker divides grapefruit into segments and removes the membranes. To remove the outer rind, the grapefruit was passed through steam, then peeled by hand

GRAPES—*Most Widely* GROWN FRUIT *in the* WORLD



With heavy strong shears this young girl harvests grapes in a vineyard near Niagara Falls Ont Not ce the th ck fru ting of this fine vine

GRAPES When Leif Eric on lande l in America in A D 1000 he was so struck by the al undance of wild grapes that he called the land Vinland w ne land There are mc re tl an 40 known spec es of wild grapes and more tl an half of them grow in North Amer ca Virtually all the rest are nat ve to Ch na and Japan Southern Asia and Europe have only one important spec es *Vitis vinifera* This is the species grown in California which now produces about 90 j er cer t of the Un ted States grapes

Commerc al grape growing in the United States started on the eastern seaboard The early colonists had brought grapevine cuttings from Europe and planted them carefully but all died Later Ameri cans experimented with native wild grapes Some growers had good success w th the fox grape species *V tis lobrusca* In 1809 Thomas Jefferson wrote I think it w ll be well to push tl e culture of this grape without los ng time and effort in the search of foreign varieties which it will take centuries to adapt to our so l and cl mate

Jefferson w as right about grape growing in the Eastern United States Today almost all the grapes gro vn in all the states east of the Rocky Mounta ns come from careful development of the fox grape About three fourths of those produced are Concord grapes This plump bl ie purple type is a table jelly and ju ce grape It is not suited for wine making

How the Concord Became a Great Crop

Chance played a large part in develop ng the Con cord In 1840 some boys of Concord Mass picked small rather sour wild g apes in tl e woods As they munched them on the way home they spit the puck- ng seeds into the r hands and tossed some on land be long ng to Ephra m W Bull Seedlings sprung up and he saved one When it fruited three years later he planted its seeds then saved the best vine of the second generation This became the parent v ne of today s Concord grapes Bull put the Concord on the market in 1849 Concords are hardy, bear heav ly and ripen well in tl e North

Two otl er popular varieties of the fox grape species are the green Niagara and the red Ca tawba D scovered near the Catawba River in North Carolina in 1802 and introduced by John Adlum n 1823 the Catawba became a table and wi e grape especially good for champagne

Other Principal Native Species

Of the more than t vo d zen species of w ld grapes n the Un ted States only three besi les the fox grape have contributed much to grape growi n g The first is *V aestivalis* or summer grape From it comes the small sweet red Delaware grape which is second only to the C ncord in favor From the species *V ul pina* comes the hardy dark Clinton Its fruit is small and sour but it is a fine cooking grape Tl e Clinton s chief values are its vigor and its resistance to disease Many growers use its stock for graft ng ta tier but weaker types Tl e third major species is *V rotundifolia* the muscadine grapes cultivated in the deep South The best-known variety is the yellow-green thick skinned Scupper nong which has a plumlike taste

Grape gro v ng is called *viticulture* from the Lat n *vitis* (vine) and the Engl h culture Growers or viticulturists have developed about 1 000 varieties of grapes in tl e Un ted States and are constantly add ng var ations The dist nctive colors of grapes are in the outer skin They range from pale green or yellow to red purple black and even variegated

Cal fornia Vineyards Lead the Nation

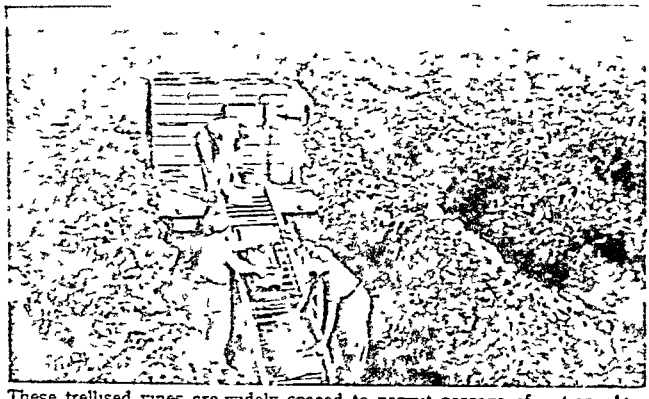
Great vineyards many of them irr gated spread over the coastal and interior v alleys of California Grapes are usually the third most valuable crop in the state Ca ifornia s grape cu ture began in a small way when Spanish missionaries brought in cuttings of *V itis vinifera* the Old World grape about 1780 Tl s is the species tl at fa led in the eastern sea- board colonies destroyed by chill winters humid ty an l the insect pest cal ed *phylloxera* It thrived however in Cal fornia s mil l w nters and lry growing season As agriculture developed in California vit culturists imported varieties of the Old World grapes from Europe and also developed ne v ones

The Ol l World grapes have a meat er pulp than the native species of the Eastern Un ted States an l so are better for raisins includ ng the dr ed currants Among the Old World table grapes in Cal fornia are the amber Thompson Seedless the early Re l Malaga and the Flame Tokay—the fruit salad grape The chief California wine grapes include the blue Zinf n del the aromatic Riesl ng and P not Blanc which is largely used for cl ampagnes Most raisins are dried from the Thompson Seedless (*See also* Ra s ns)

New World Stock Saves Old World Grapes

In the 19th century growers in France experimented with cutt ngs from native Amer can species In 1860

AT WORK IN MODERN NORTH AMERICAN VINEYARDS





These trellised vines are widely spaced to permit passage of the pick-up truck. A conveyer rolls the boxes up onto it. Old European terraced vineyards are too crowded for mechanization. At right, a vineyard worker sprays vines against insect pests. Grape growing requires more expert care than most other crops. The soft, well-drained soil is good for grapes.

some of the imported cuttings carried the grape phylloxera the aphid that had destroyed all the Old World vines in early America. By 1888 the whole French grape industry was threatened with destruction. After many futile measures, the scourge was checked by introducing whole vines from America, as they had become immune to phylloxera through centuries of attack. France's famed varieties of Old World grapes now grow, unchanged, grafted on American roots. Some growers in other nations also follow this practice.

Grape growing is the largest world-wide fruit industry. France leads all nations, followed by Italy, Spain, the United States, Argentina, and Portugal. California grows 90 per cent of the United States grapes, usually 2,500,000 to 2,800,000 tons—about 10 per cent of the world crop. New York follows with 50,000 to 74,000 tons yearly. Other chief producing states are Michigan, Pennsylvania, and Washington. Every state in the nation grows some grapes.

How Grapes Are Grown

Grape culture is one of man's oldest arts. Grape seeds have been found with mummies in Egyptian tombs at least 3,000 years old. Vines grow in many soils and climates, but they thrive best in sandy, well-drained loams and warm, sunny locations. They are rarely grown from seeds. A common method of propagation is to plant cuttings (sections of branches) from mature vines. Another method is *layering*. This is done by bending down a lower branch of a mature vine and forcing the branch to grow along a shallow trench in the ground. After shoots start to grow upward from buds on the branch, the trench is filled with earth. The shoots then develop roots. By fall or winter the shoots are ready to be cut, roots and all, from the parent branch and can be planted in the spring as new grape vines.

Sometimes grapes are propagated by grafting cuttings on rootstocks of vines. As the vines develop, they are pruned regularly to insure a quantity of high quality fruit. Pruning frees them of diseased branches, such as those afflicted with black rot. Pruning is also needed to train the vines to grow on upright stakes and then on trellises. In California many growers train the vines on stakes only, and so their vineyards are free of trellises and can be cultivated crosswise as well as lengthwise.

Vines require periodic spraying against insect pests and disease. The vines repay good care; some remain fruitful for 300 or 400 years.

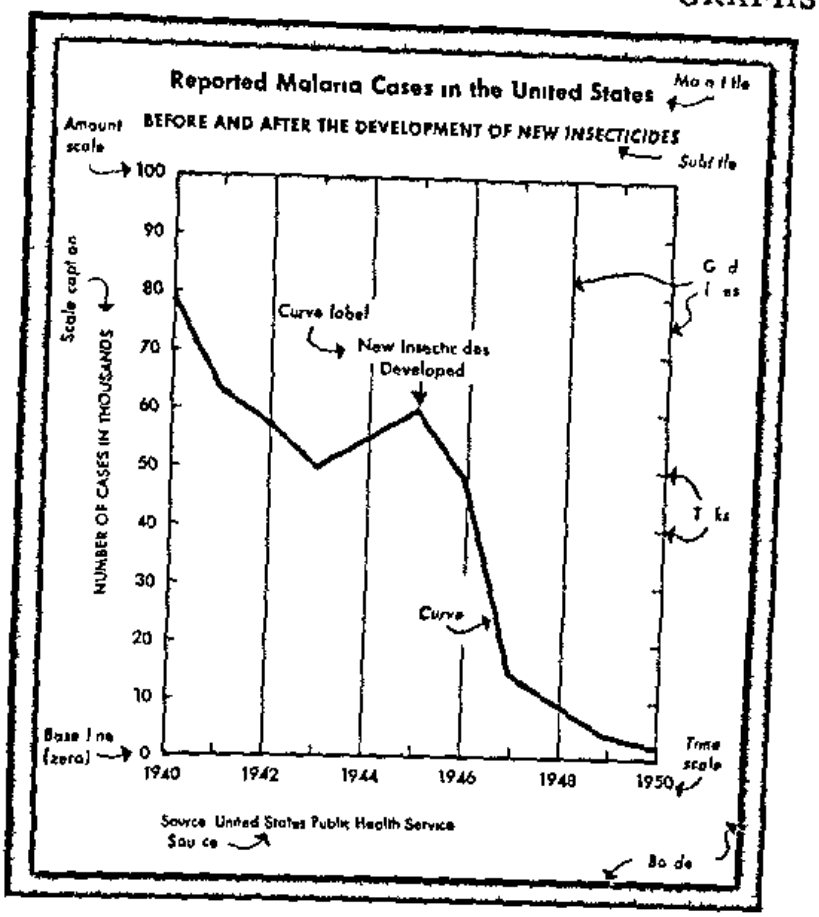
Fermented grape juice makes wine. Fermenting raises a grayish or reddish crust in the vat. This crust is a crystalline substance called *argol*. When refined argol becomes the cream of tartar used in medicine and baking powders. Unfermented grape juice is made from Concords. Grapes are rich in sugar and a source of vitamin B and iron. (*See also* Currants.)

GRAPHITE. When you make a mark with the "lead" of a pencil, you are putting on paper tiny crystals of graphite. This soft, slippery mineral (also called "black lead" and "plumbago") is an allotropic form of carbon (*see* Carbon; Pencils). Graphite makes an excellent lubricant, because its multitude of crystals readily adhere to rough metal, producing a smooth surface and reducing friction. The chief use of graphite, however, is in foundries, where it gives a smooth facing (lining) to sand molds in which metal castings are made. Much is used also for crucibles, because it withstands terrific heat; and for electrotyping and electrical apparatus, because it is a good conductor of electricity. Another important use is in paints.

Graphite of high purity is artificially made from anthracite waste in electric furnaces at Niagara Falls, N. Y. Artificial graphite is also made in Canada and other countries. Most of the mined graphite comes from Korea, Ceylon, Madagascar, Germany, Czechoslovakia, Austria, Russia, Italy, and Mexico.

The United States has much graphite, but mines relatively little because the deposits are low grade. Colorado, Michigan, Nevada, and Rhode Island have "amorphous," or soft, graphite; crystalline graphite occurs in Alabama, Alaska, California, New York, Pennsylvania, and Texas. The United States imports more than it produces of both natural forms.

How to MAKE *and* READ GRAPHS *and* CHARTS



GRAPHS Most people find it difficult to make meaningful comparisons between numbers They find it especially difficult if the numbers are large or if there are many of them as in long statistical tables Graphs and charts make it easy to compare quantities because they show the relationships with dramatic simplicity Even for the statistician an accurate graph can often reveal facts that were not clear in the original data For this reason statistical data gathered for governments industry and science are often shown in graphic form

The use of graphs and charts is constantly increasing In books magazines and newspapers we frequently see bar charts pie charts line graphs and pictorial charts The common types of charts are here illustrated in simple form While each type has its purpose there is usually a choice of several ways to chart a given set of statistical data

Materials and Tools for Chart Making

Paper For the working drawings time can be saved and accuracy gained by using printed graph paper Graph paper is usually available with squares ruled in quarters fifths or tenths of an inch Since the scales used for charts usually follow the decimal system graph paper ruled in tenths of an inch is more convenient to use than a ruler which is divided into sixteenths of an inch For the final chart plain white paper or illustration board should be used

Tools The tools used for making charts are the same as those used for mechanical drawing—a drawing board or table T square triangle protractor ruler and ruling pen For pictures of these tools and instructions on how to use them *see* the article Drawing (Special protractors are made for chart work that divide the circle into 100 parts instead of 360° and rulers can be obtained that divide the inch into tenths) The chart maker should also have scissors fine brushes a hard lead pencil for plotting India ink a gum eraser rubber cement and red blue and green pencils

Lettering and Color To letter by hand (*see* Drawing) simple block capitals should be used Individual cutout letters and numerals with gummed backs can be purchased in various sizes Color can be put on the finished drawing with colored inks or paints or by pasting on colored paper For bar charts and for large broken line graphs colored tape with a gummed back may be used

How to Construct a Simple Chart

The first step is to study the statistical data to decide what are the significant features For example do the data show a trend over a period of time or do they show the relations of absolute quantities at a particular point in time? Next select the type of chart that will show the essential features accurately and clearly Then decide upon size and proportions Make different rough sketches on graph paper before selecting the final chart

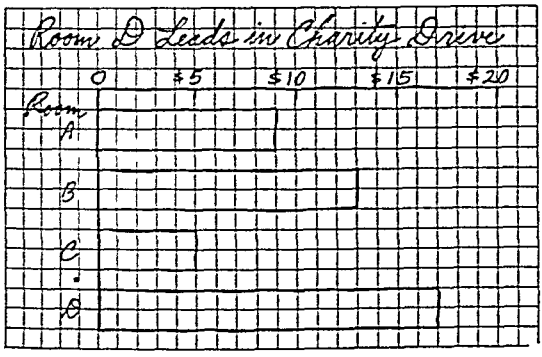
Title The title should be at the top centered between the border lines if there is a border The main title should tell quickly what the chart is about A subtitle and explanatory notes may be added for clearer understanding

Source The source of the data should be stated The usual place is the lower left-hand corner

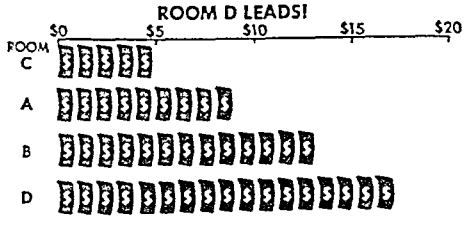
Grid The grid should show equal units of 1, 2 5 10 25 or some multiple of 10 The size of the unit depends upon the degree of accuracy required in reading the chart When spaced too close the grid detracts attention from the curves or bars No more

Simple Comparisons of Size

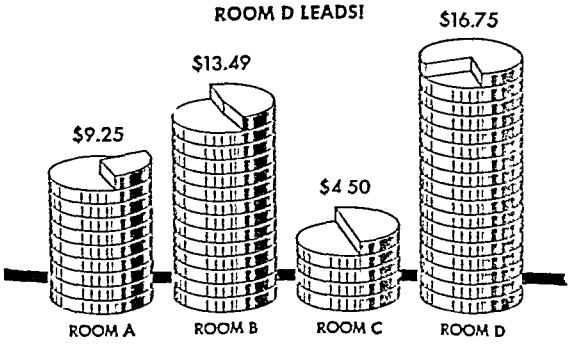
ROOM	AMOUNT	ROUNDED	ROOM	AMOUNT	ROUNDED
A	$9.25	$9.00	C	$4.50	$5.00
B	$13.49	$13.00	D	$16.75	$17.00



1. A horizontal bar chart



2. A pictorial unit bar chart



3. A pictorial column chart

lines should be shown therefore than are necessary to guide the eye. On small charts, *ticks* may sometimes be used instead of lines. For very simple bar charts, the grid on which the chart was constructed may be omitted in the finished drawing.

Weight of Lines. The lightest lines are the lines of the grid. The base line (zero) should be heavier than the other grid lines. The other outside lines are sometimes emphasized slightly. The heaviest lines should be the curves. If there is more than one curve, the lines must be distinguished by color or by various types of dotted and broken lines.

The Key. A key is sometimes needed to identify the curves or bars. It may be placed on the grid (usually in the upper left-hand corner) or below the title. Labels may be used instead of a key to identify two or more curves or bars. A label—usually with an arrow—may be used also to call attention to some significant point on a curve.

Scales. In the typical chart, the amount scale is vertical, with the smallest quantity (usually zero) at the base line. The amount scale caption states the unit used in the scale, such as "Dollars" or "Tons." The scale should be simple, with as few zeros as possible. An amount scale with figures from 1 to 6 is easier to read than one progressing from 1,000,000 to 6,000,000. The omission of the zeros must be indicated in the amount scale caption by some phrase such as "Millions of Dollars" or "Population (in Millions)."

If the chart shows a time series, the time scale is usually at the bottom, and the earliest time is at the left. The time scale designations—years, months, or hours—should be directly under the points where the data are plotted. If the data are plotted on the lines the designations are placed directly under the lines. If the data are plotted between the lines, the designations are placed between the lines.

Simple Comparisons of Size

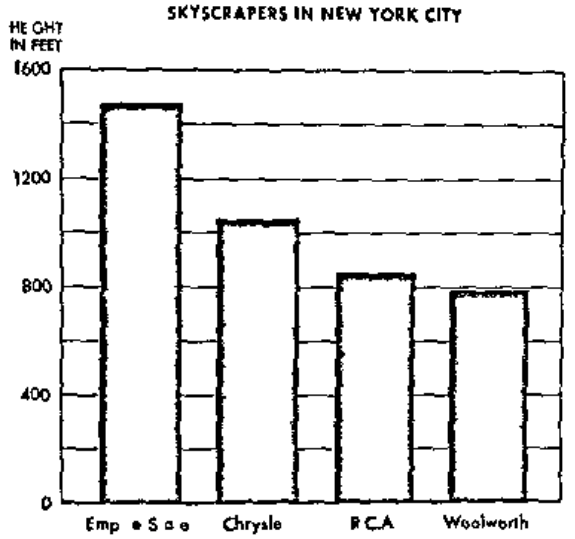
It is much easier to compare lengths of bars than it is to compare areas, such as squares or circles, or to compare volumes, such as cubes or pictures. Horizontal bars are therefore much used to show simple comparisons of different quantities.

Suppose a student wants to make a chart that will show graphically the records made by various rooms in his school in collecting money for a community charity. He would first make a statistical table like that at the top of this page showing the actual amounts collected; then he would round off the amounts. Notice that in rounding $4.50 becomes $5.00 and $13.49 drops to $13.00. The highest amount, in round numbers, is $17.00. The amount scale therefore need run no higher than $20.00.

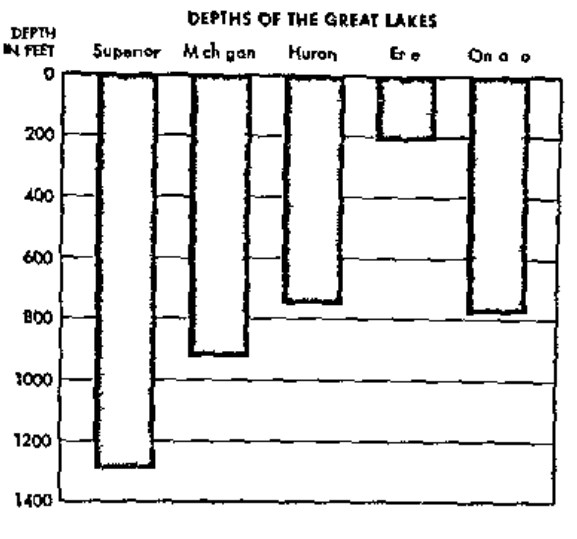
Chart 1 is a working drawing, on graph paper, for a horizontal bar chart. The bars could have been placed in order of size, with the longest bar at the top instead of in alphabetical order. With alphabetical order, the room letters may be more quickly located. The spacing between the bars should be not more than half the width of the bars. Vertical grid lines may be omitted.

In Chart 2 the horizontal bars are rows of symbols. Each symbol represents one dollar. In Chart 3 stacks of coins take the place of horizontal bars. Notice that a part of a symbol is used to indicate an amount less than $1.00. Since the labels show the actual amounts collected by the different rooms, the amount scale is omitted. (For other examples of pictorial charts in bar form, *see* Food; Russia; United States.)

Simple Comparisons of Size



4 A column or vertical bar chart



5 A column or vertical bar chart

It seems natural to use vertical rather than horizontal bars to show heights of buildings and lengths of lakes. In Chart 4 the bars extend upward from the base line zero. In Chart 5 the bars extend downward from the base line to show depth. In Chart 4 comparisons are made easier by showing the heights of the buildings in descending order. In Chart 5 the order of the bars corresponds to the geographical location of the lakes from west to east. Compare this chart with that in the article Great Lakes.

100 Per Cent Bar Charts and Circle Graphs

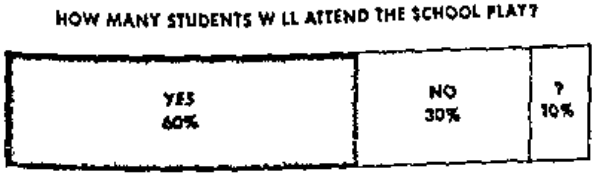
Sometimes it is desirable to base a chart on percentages rather than on absolute amounts. For this purpose circles or bars are usually used. The entire circle or bar represents 100 per cent (*see* Percentage).

A student took an opinion poll in his school to find out how many children expected to attend a certain school play. Of the 50 children interviewed as a sample 30 said yes, 15 said no, and 5 were undecided. The results of the opinion poll can be shown as percentages by bar charts or by a circle graph (also called a pie chart). For the bar charts it is necessary only to find what percentage of the total voted yes, what percentage voted no, and what percentage was undecided. Then the segments are laid off on the bar scale in order of size. For the circle graph the percentages have to be converted into degrees in order to divide the circle into segments. (The number of degrees in a circle is 360.)

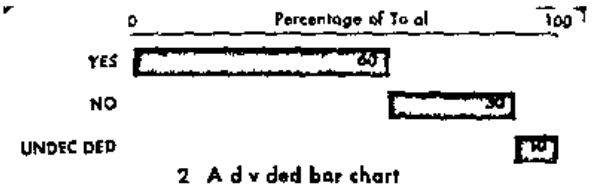
Chart 1 shows the results of the poll as a 100 per cent rectangle or component bar chart. Grid lines are unnecessary because each segment is labeled and the percentage it represents is indicated. In Chart 2 the bar is divided into three parts. (For other examples of the 100 per cent bar chart *see* Air Safety; *see also* the Fact Summary for each state.)

100% Bar and Circle Charts

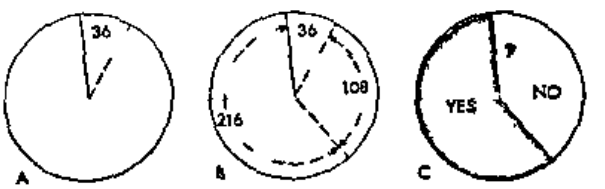
	Number of Children	Percentage of Total	Degrees
Yes	30	60	216
No	15	30	108
Undecided	5	10	36
Total	50	100	360



1 A rectangle or component bar chart

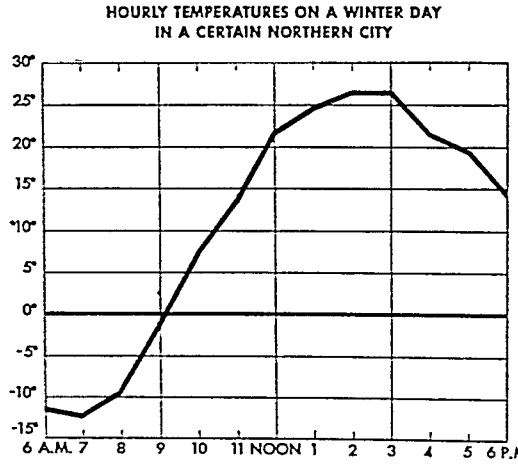


2 A divided bar chart

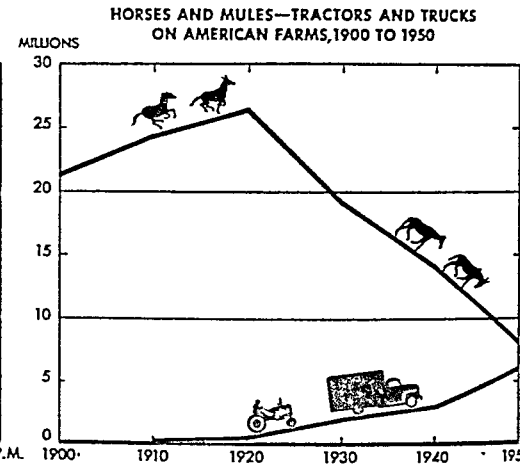


3 A circle graph or pie chart

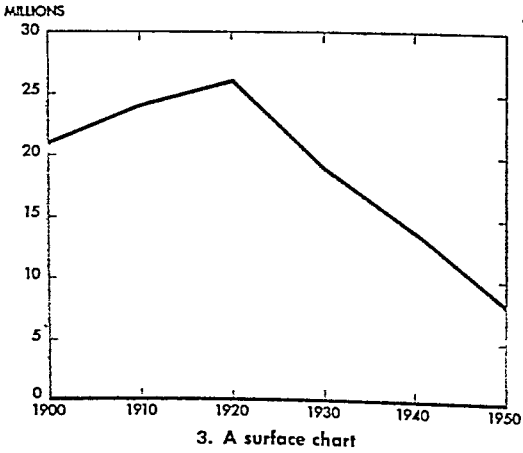
Time Series Line Graphs



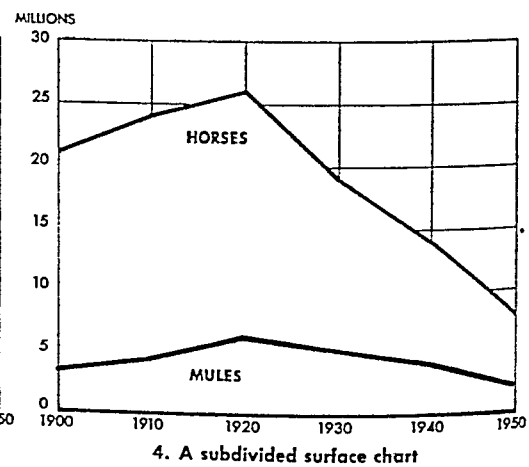
1. A single curve line graph



2. A multiple curve line graph



3. A surface chart



4. A subdivided surface chart

Diagrams A and B show the steps in making a circle graph. We first draw a circle, with a compass, of the size we want. From the center of the circle we draw a line to the circumference. This line is a *radius*. We lay the base of the protractor along this radius, mark on the circumference an angle of 36°, and draw another radius. Then we lay the protractor base line along the radius just drawn and measure off an angle of 108°. The sector remaining should measure 216°. The circumference of the circle (360°) represents 100 per cent, just as the bar does.

Time-Series Line Graphs

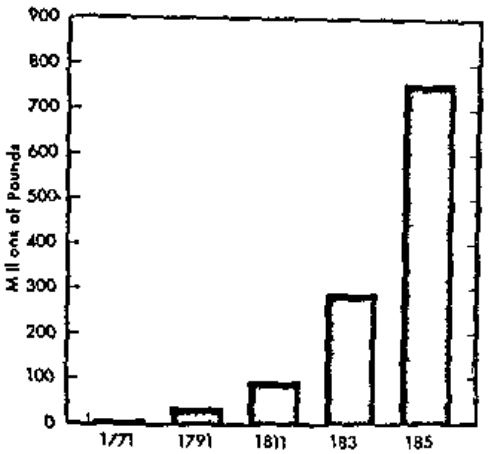
The charts so far presented show numerical values of different items at the same point in time. One of the most important uses of charts is to show changes over a period of time. Both curves and bars are used for this purpose. When the emphasis is on movement, the line graph is usually preferred because a curve moving across the face of the grid gives a quick picture of a trend.

The time scale is laid out across the bottom. The amount scale is usually at the left but may be placed at the right if the chief interest is the amount at the latest date, as in graphs showing stock market prices. If the grid is wide the amount scale should appear on both sides.

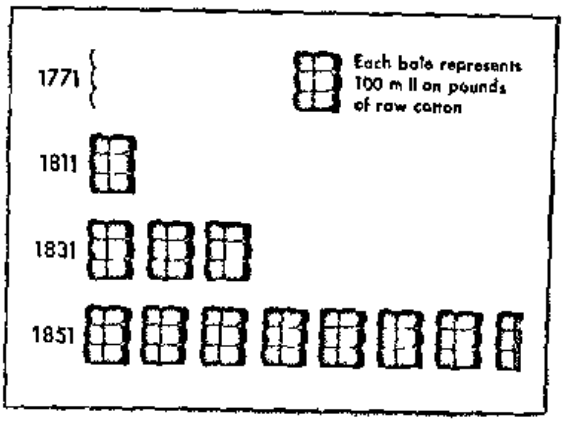
In Graph 1 the amount scale does not begin with zero because temperatures both above and below zero are recorded. To emphasize the zero line, it is made heavier than the other lines on the grid. The time-scale designations are placed directly beneath the vertical lines, rather than between them, because the temperature readings were taken exactly on the hour and do not represent the average for the hour. The

Time Series Bar Charts

IMPORTS OF RAW COTTON INTO GREAT BRITA N DURING THE INDUSTRIAL REVOLUTION

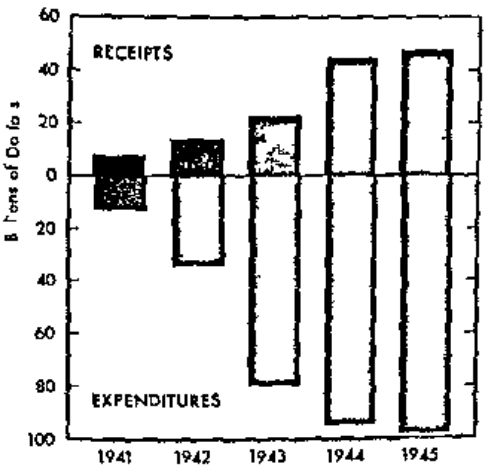


5 A simple column chart

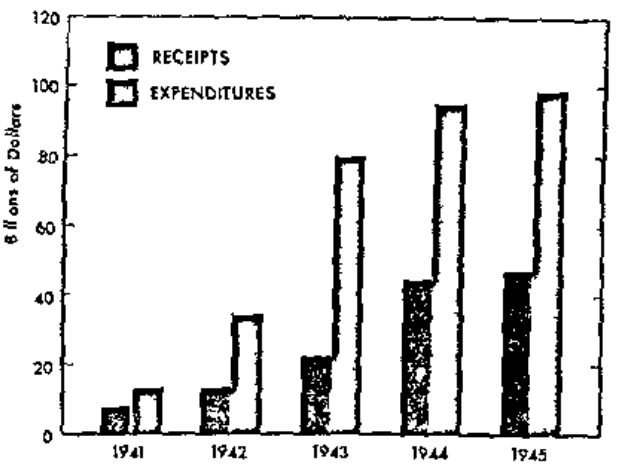


6 A p ctorial un t bar chart

RECEIPTS AND EXPENDITURES OF THE UNITED STATES GOVERNMENT DURING THE WAR YEARS 1941 45



7 A float ng column chart



8 A compound column chart

points are plotted directly above the time-scale designations and then connected with stra ght lines

In Graph 2 two curves are shown on the same grid Comparison of the two curves makes clear that the horse and mule populat on declined as the number of tractors and trucks increased On this graph pictorial symbols take the place of curve labels

In Chart 3 the curve is emphasized by shading the area beneath it In Chart 4 the divided surface separates the horse and mule populations

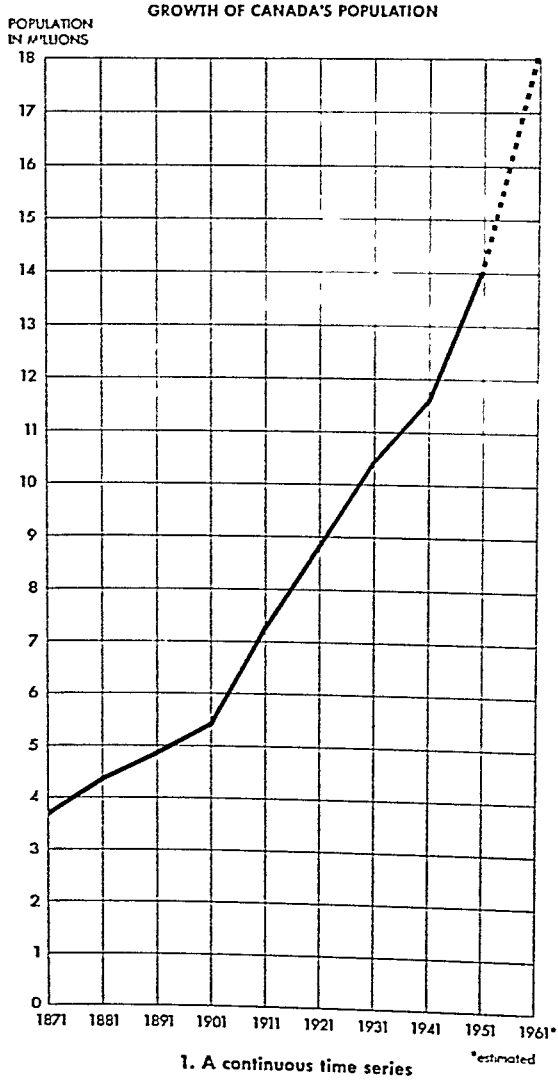
Time Series Bar Charts

A limited number of changes over a period of time can sometimes be shown more clearly and dramati cally by a bar chart than by a line graph Vertical columns are preferred to horizontal bars when time is involved As in the line graph the time scale should be at the bottom Usually the vertical grid is omitted The horizontal grid may be eliminated also if a general trend is to be emphasized rather than particular amounts

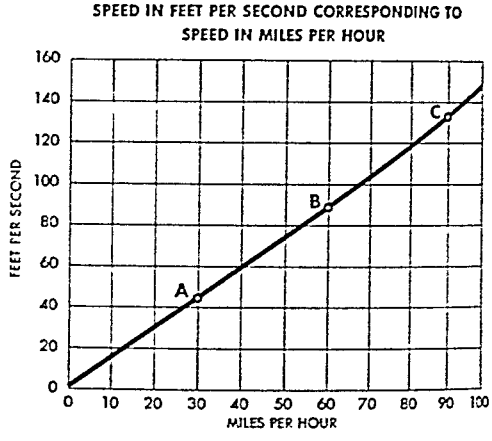
When a time series is shown in pictorial form horizontal rows of symbols are usually preferred to vertical piles The time scale is then moved to the left with the earliest time at the top Chart 6 shows in pictorial units the same general data as Chart 5 (For other examples of time-series pictorial charts *see* Health Land Use United States)

Sometimes it is desirable to use two or more sets of bars on the same chart to compare two or more series of related data Charts 7 and 8 show two ways of contrasting receipts and expenditures Chart 7 is a floating column chart so called because the zero line floats and a second amount scale runs down from it Chart 8 is a compound column chart A

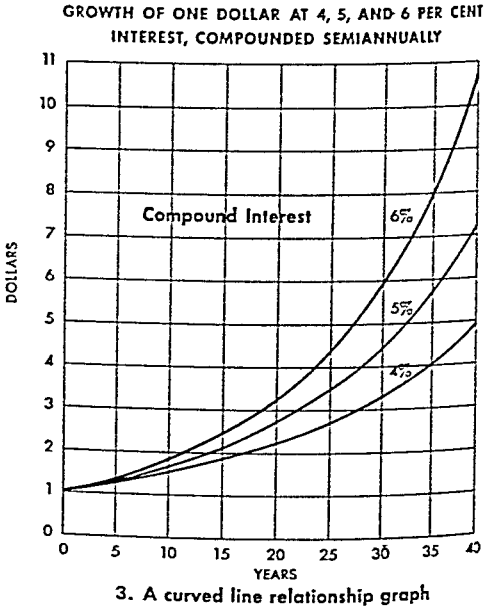
Curved and Straight Line Graphs



1. A continuous time series



2. A straight line relationship graph



3. A curved line relationship graph

double bar, in two colors, contrasts receipts and expenditures for each year.

It is easier to compare year-by-year receipts or year-by-year expenditures with Chart 7. However, it is easier to compare receipts and expenditures for each of the given years with Chart 8.

Curved and Straight Line Graphs

Continuous Time Series. The line graph is preferred to the bar chart when many large numbers are to be plotted and the data are continuous—that is, when there are no breaks in the series represented. (For an explanation of continuous and "discrete" data, *see* Statistics). In Graph 1, "Growth of Canada's Population," the rise of the curve shows the trend at a glance. (*See* United States for a similar population line graph.)

Graphs of Relationship. It is sometimes desirable to show in graphic form the relationship between two sets of associated data. If the relationship is perfect, the line connecting the plotted points will be a straight line, as in Graph 2, or a smooth curve, as in Graph 3.

There is a perfect relationship between speed in feet per second and in miles per hour. To plot this graph we figured that the speed at 30 miles an hour would be 44 feet per second. Sixty miles would be 88 feet and 90 miles would be 132 feet. We first placed a point at A on the grid line running down to 30 and across to 44. Then we located point B

and drew a straight line through the two points To check the line we located point C If the line had not run through C we would know a mistake had been made

Graph 3 shows the relations of three different curves to one another (For a graph showing the relation of simple interest to compound interest see Percentage and Interest)

Simple Frequency Distribution

In order to plot any statistical data the numbers must first be arranged in some systematic order We have seen that for time-series graphs the data are distributed according to time of occurrence For some types of data—such as measurements of height weight or scores—the time element does not enter In order to plot such data it is advisable to find out how frequently each measurement occurs This is done by tabulating the numbers in groups Measurements ranging from 10 to 14 for example might be tabulated in one group 15 to 19 in a second group and so on Such a grouping is called a *frequency distribution*

A teacher gave a spelling test to 58 pupils The test consisted of 50 words and was scored according to the number of words spelled correctly The highest score was 48 and the lowest was 11 Some scores between 11 and 48 were not made at all Others were made by more than one pupil To provide a clear picture of the way the scores were distributed they were tabulated according to the frequency of their occurrence in equal intervals of five scores each Each tally mark in the table represents one score The intervals are sufficiently wide so that no vacant classes occur (*See also* Statistics)

Histogram Chart 1 is called a *histogram* a *column diagram* or a *rectangular frequency polygon* The horizontal scale shows the measurements represented in order of size The first interval on the horizontal scale is used to indicate the first class interval Since no pupil made a score below 10 the scale begins with 10–14 inclusive The vertical scale like the usual amount scale begins with zero

To plot the chart a horizontal line is drawn across each class interval at the proper height on the vertical or frequency scale The result is a series of connected columns one for each class interval in the table The number of occurrences (*frequencies*) in each interval is shown by the height of the column In form the histogram resembles the vertical bar chart since lengths of columns are compared However in the histogram there is no spacing between the columns because there are no breaks in the series

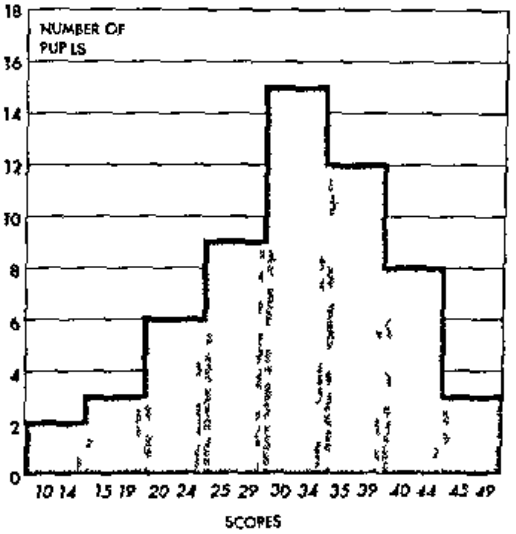
Frequency Polygon Any data represented by a histogram can be represented also by a line graph as a frequency polygon The same frequency table for the spelling test scores used to plot Graph 1 was used for Graph 2

To plot the frequency polygon we assume that the scores are distributed evenly throughout each class interval On the horizontal scale the lower limit of one group is used as the upper limit of the pre-

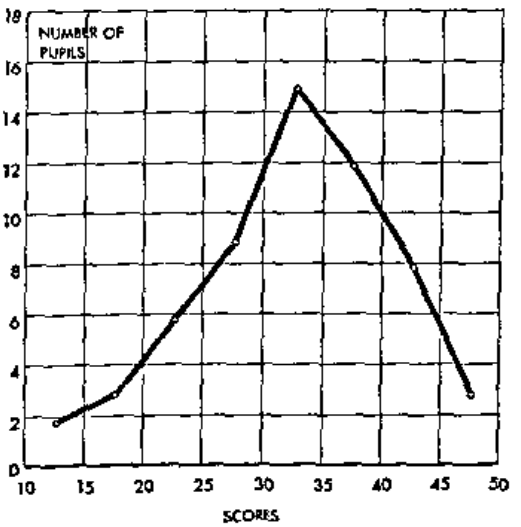
Simple Frequency Distribution

Class Interval	Tally	Number of Scores
45 49	𝍸 | | |	3
40 44	𝍸 𝍸 | | |	8
35 39	𝍸 𝍸 𝍸 | |	12
30 34	𝍸 𝍸 𝍸 𝍸	15
25 29	𝍸 𝍸 | | | |	9
20 24	𝍸 𝍸 |	6
15 19	| | |	3
10 14	| |	2

SCORES MADE BY 58 PUPILS ON A 50-WORD SPELLING TEST



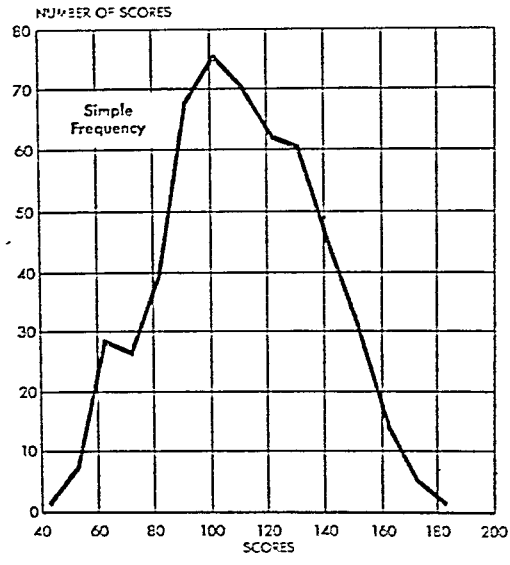
1 A histogram



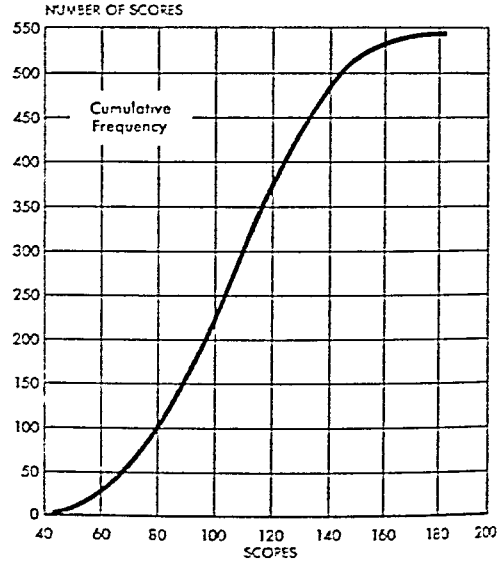
2 A frequency polygon

Simple and Cumulative Frequency Distributions

SCORES MADE BY 544 PUPILS ON A GROUP INTELLIGENCE TEST



1. A frequency polygon



2. An ogive

Interval	40-49	50-59	60-69	70-79	80-89	90-99	100-109	110-119	120-129	130-139	140-149	150-159	160-169	170-179	180-189
Simple Frequency	2	8	29	27	40	68	76	71	63	61	45	31	15	6	2
Cumulative Frequency	2	10	39	66	106	174	250	321	384	445	490	521	536	542	544

vious group. Points are plotted, at the proper heights, at the mid-point of each interval. For example, to show the scores in the 10–15 interval, a dot is placed at 12½, halfway between 10 and 15 and opposite 2 on the vertical scale. To show the 3 scores in the next interval, a dot was placed above 17½ (mid-point of the 15–20 interval) and midway between 2 and 4 on the vertical scale. When all the dots had been placed, they were connected with straight lines. (For other examples of charts showing frequency distributions, *see* Statistics; Intelligence Tests; Individual Differences.)

Simple and Cumulative Frequency Distributions

The frequency table for Graphs 1 and 2 shows the distribution of scores made by 544 students on a group intelligence test. Notice that the scores are tabulated by frequency of occurrence in the first row and are cumulated in the second row. A cumulative frequency series is compiled by adding the successive simple frequencies for each interval so that each number in the cumulative series includes all the preceding numbers.

Graph 1 is a *frequency polygon*. It was plotted from the first row of the table. Graph 2, plotted from the bottom row, is an *ogive*. Cumulation of data tends to smooth fluctuations of a curve. Notice that the curve runs diagonally across the grid in the form of an S. This S curve is characteristic of the ogive.

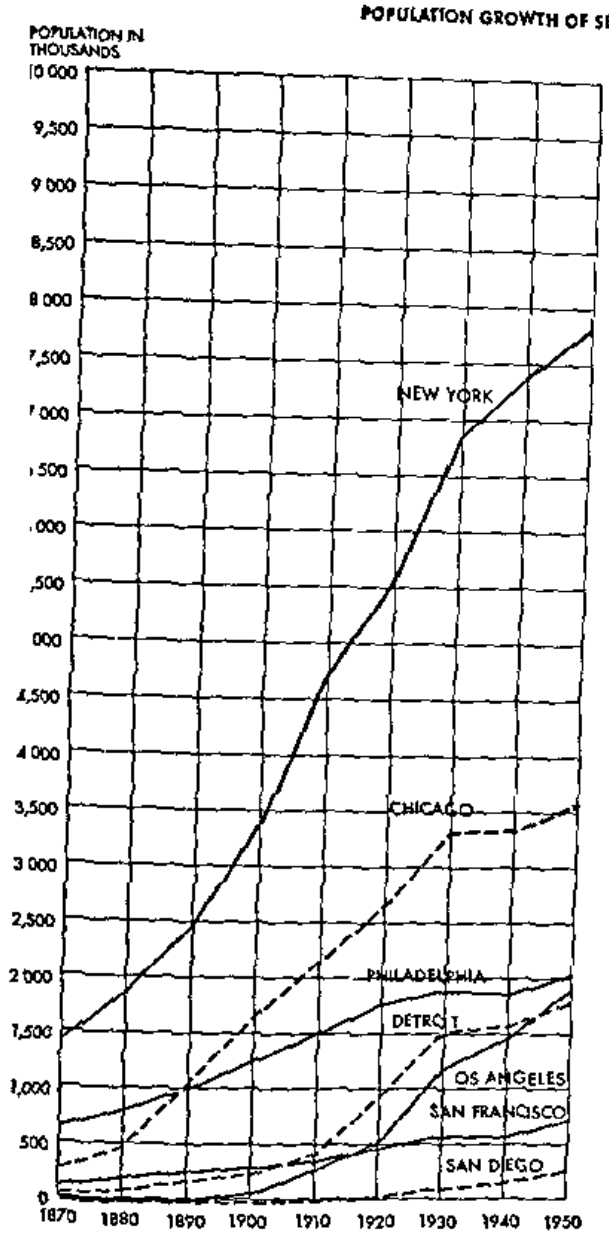
The Ratio Chart with Logarithmic Rulings

Suppose that the population of a town of 6,000 increases in ten years to 6,600. The absolute growth can be expressed by the statement, "Our town has 600 more people than it had ten years ago." If, however, we want to express its *rate* of growth relative to its former size, we would say "Our town's population has increased 10 per cent in ten years." If another town increases from 12,000 to 12,600 in the same period, the *absolute* growth of the two towns is the same, but the relative growth of the second town is only 5 per cent. Thus the rate of change, or percentage increase, depends not only upon the amount of change but also on the *base amount*.

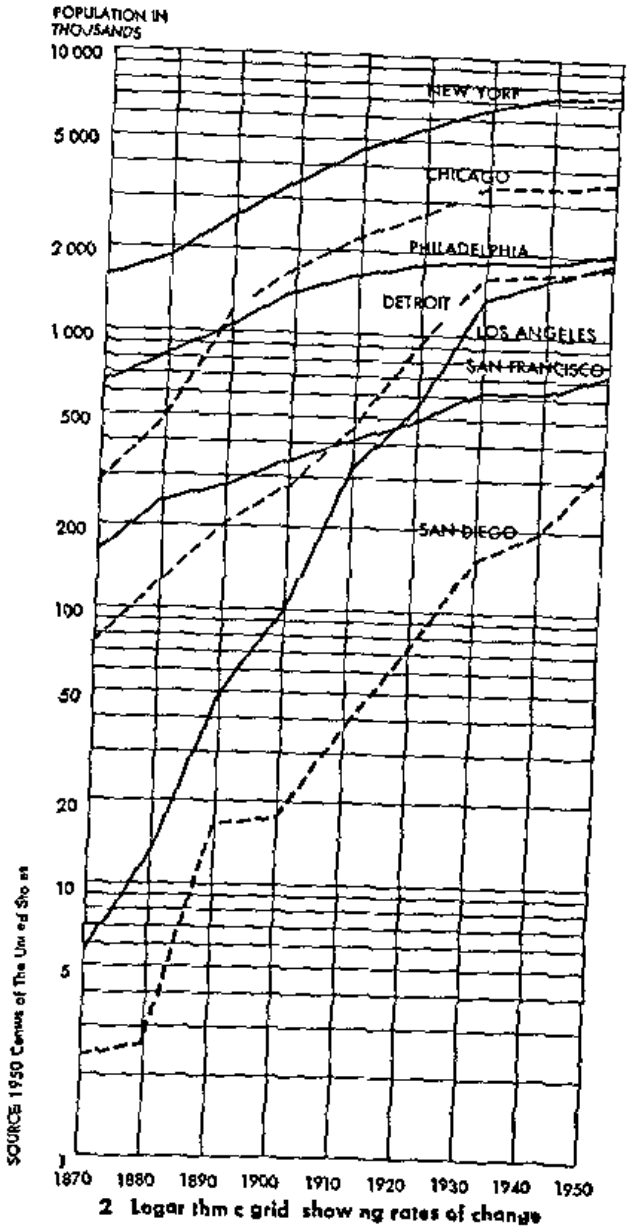
Charts 1 and 2 (on the opposite page) show the growth of seven cities in the United States—the five largest, and two others (San Francisco and San Diego) chosen for purposes of comparison. Chart 1 shows absolute growth and Chart 2 shows rate of growth. Both charts have the same time scale and the same vertical grid lines, and both have an amount scale running to 10,000 thousands. The difference between the two charts is in the horizontal grid lines.

Arithmetic and Ratio Charts Compared

POPULATION GROWTH OF SELECTED CITIES IN THE UNITED STATES



1 Arithmetic grid showing absolute gains



2 Logarithmic grid showing rates of change

On Chart 1 the spaces between the horizontal grid lines are equal and indicate equal quantities This type of scaling is called an *arithmetic grid* On Chart 2 the horizontal grid lines are not equally spaced but ruled to represent percentage changes This type of scaling is called a *logarithmic grid* Actually it is semilogarithmic because it has an arithmetic ruling on *one of the scales* Charts with both horizontal and vertical log rulings are uncommon

The absolute difference between 10 and 1 is 9 and the absolute difference between 100 and 10 is 90 However 10 has the same ratio to 1 that 100 has to 10—the ratio of 10 to 1 On the logarithmic or ratio scale 1 and 10 are the same distance apart as 10 and 100 The distance on the scale between 10 000 and 1 000 is also the same as the distance between 10 and 1 because 10 000 has the same ratio to 1 000 that 10 has to 1

Equal distances on the log scale always represent equal percentage changes For example if there is an increase of 10 per cent in one period in the populations of two cities both curves will rise an equal distance although one city may be large and another small The two curves will be parallel lines

If we look at the chart with the arithmetic grid we might get the impression that New York City grew more rapidly than San Diego Chart 2 shows very clearly that San Diego grew at a faster rate

In addition to studying relative or percentage changes, logarithmic charts are used to compare two series that differ widely in amount. Suppose we wanted to compare the population growth of San Diego with the population growth of the United States as a whole from 1870 to 1950. An arithmetic grid could not be used because the curve showing the population growth of San Diego would appear as a relatively straight line (below 4 million) as compared with the steep rise of the United States curve. A semilogarithmic grid would show that the population of San Diego actually increased very much faster than the population of the United States in this period. (*See* United States for arithmetic and ratio charts showing rise of population of the country as a whole; *see also* Powers and Roots; Logarithms; and **Logarithms** in FACT-INDEX.

Statistical Maps

Statistical maps compare quantities, like other charts, and at the same time indicate the location of the quantities. Plain outline maps, without mountains and rivers or state and city names, are generally used for charting.

Relative quantities of the same item may be shown in a variety of ways. On shaded black and white maps, black usually represents the largest quantity and white indicates the absence of the item studied. Between black and white, various shadings or cross-hatchings, explained by a key, show the relative importance of the quantity groups. Different shadings in color or different colors are also used. (For examples, *see* Population; United States (Population Density by Counties); World (Population); *see also* Rainfall.)

Dots may be used instead of shading to show varying quantities. Each dot represents a fixed quantity. When circles of different sizes are used, each size represents a different quantity. When the dots are of the same size, they are crowded close together in the areas of greatest density. (*See* maps in the article United States showing areas producing corn, wheat, oats, hogs, and cattle.) Small bar charts are sometimes placed on maps to show relative quantities of the same item (*see* Agriculture).

When many different items, such as farm and mineral products, are shown on the same map, the items are usually distinguished by pictorial symbols that are explained in a key. (For examples of this type of map, *see* Russia; Africa; Australia; South America; North America.) When only a few different items are represented, shadings or cross-hatchings may be used. (*See* Grasslands; Land Use.)

Organization and Flow Charts

The organization chart does not show quantities. Its purpose is to present in diagrammatic form the interrelations, the responsibilities, and the authority of the various units of an organization. The units may be officials or they may be departments of a government or a business. The names of the units are usually enclosed in boxes or circles, and these are joined together by lines that indicate the flow of responsibility and authority. (For examples, *see* Police; United Nations.)

The name *flow chart* is given to organization charts that show successive movements through a process, from beginning to completion. The simplest type of flow chart resembles the organization chart, with arrows indicating the direction of the flow. A more striking form of flow chart shows pictures of the various steps. (For examples, *see* Cement; Internal Combustion Engine; Iron and Steel; Paper; Petroleum; Refrigeration.)

Other Types of Graphs and Charts

Probably the earliest charts were maps of heavenly bodies and their movements. Later, charts were used as maps of sea lanes for navigators. Both types of charts are used similarly today. (*See* Stars.) Maps are sometimes distorted in size and shape for emphasis. Pins stuck in standard maps locate customers or facilities. Comparisons of almost any sort can be visualized by ingenious graphs.

Great ingenuity has been shown in the designing of charts for advertising and in the animated charts for instructional movies seen in classrooms and on television. These charts add meaning to statistics by giving movement to people, machines, lines, and bars.

Books about Graphs

Arkin, Herbert and Colton, R. R. Graphs, How to Make and Use Them (Harper, 1940).
Modley, Rudolf and Lowenstein, Dyno. Pictographs and Graphs (Harper, 1952).
Spear, M. E. Charting Statistics (McGraw, 1952).

GRASSES. Of the many plant families, the grasses are the most useful and important. They carpet a large part of the earth's surface and furnish, directly or indirectly, most of our food. The world's bread is made from the cereal grasses, such as wheat, corn, oats, rye, barley, rice, and millet; and cereals and other kinds of grasses furnish most of the pasturage that fattens our meat animals.

Grasses are also the most widely distributed of plant families. Pygmy grasses, mosslike grasses not over two inches high, cling close to the cold ground right up to the borders of the field of ice and snow. The giants of the family are the bamboos, which grow 100 feet tall or more in the burning heat of the tropics (*see* Bamboo). Other tall species form the almost impenetrable canebrakes of the South. These are used for fishpoles and for "reed" furniture and "cane-seated" chairs. Small and middle-sized grasses, growing in greatest luxuriance in the North Temperate Zone, make up most of the more than 4,000 species included in the family. In the United States alone there are more than 1,000 species. One dooryard may contain a dozen kinds or more.

Grasses grow on all kinds of soil and in all sorts of conditions. They thrive on the banks of streams, along the seashore, in the low, wet marshlands, in the sunny meadows, or in the shade of woodland and orchard. Some varieties, such as sweet vernal grass, June grass, and orchard grass, are among the first spring plants. Others, like timothy, redtop, and

hair grass, flourish in midsummer Even autumn has its grasses—the beard grass and the dropseed grasses of September and later

Some species are valued mainly for lawns and parks Kentucky and other bluegrasses and the bent grasses are popular They make a thick carpet of dark green color Many grasses are raised in gardens for their plumy sprays Among them are pampas grass bottlebrush grass, eulalia and ribbon grass

Grasses Check Erosion

After algae, fungi and mosses grasses are among the first plants to cover barren places and to prepare the way for plants of larger and slower growth Many grasses spread by means of runners or root-stocks These are underground stems with a succession of joints From the joints roots grow downward and stems grow upward Thus a network of roots and stems reaches in all directions binding the soil firmly in place Such a network with its thick mat of turf helps prevent the topsoil from blowing away It also slows down the evaporation of moisture and the run-off of water and soil during and after a rain

When the grass cover is destroyed erosion often follows On the Great Plains of North America farmers plowed up the native grasses or permitted them to be overgrazed This resulted in dust storms, which reduced the land to a near desert (*see* Ecology) Elsewhere farmers plowed up grassy hillsides and planted such crops as corn on them Soon rainfall and running water were washing away the soil and were cutting gullies in their land To hold the topsoil, grasses are planted on hillsides and wind swept fields and along highways and railroads



A HUNGRY SHORT-HORNED 'HOPPER

This grasshopper looks harmless enough but it is a destructive pest When grasshoppers migrate in large numbers they may eat every green plant in their path

Grasses will grow where ground moisture is not sufficient for trees All the continents once had grasslands but much of this land is now under cultivation (*see* Grasslands) In the United States blue stem was the leading tall grass on the *prairies* stretching westward from the eastern forests across the Mississippi In the northwestern prairies needle and wheat grasses were characteristic West of the 20-inch rainfall line the Great Plains was short-grass country (classified as *steppe* by geographers) Here the chief species buffalo and grama grasses afforded fine pasture first for buffaloes then for cattle Both tall and short grasses formed a sod with suitable moisture and grew as bunch grass in drier places

Winners in the Plant Race of Life

Grasses are well fitted for survival They renew themselves and spread from rootstocks or by scattering their seeds They grow rapidly Some species grow two or three feet in 24 hours and the bamboos may reach a height of a hundred feet in three months

Grasses are able to resist drought because they have thin walled cells between the veins of their leaves These cells keep the leaves expanded under normal conditions but roll up the leaves to slow down evaporation during a drought Because grasses are hardy and grow rapidly, some of them become persistent weeds Among the worst are Bermuda grass, Johnson grass, and quack grass (*see* Quack Grass)

Grasses form the botanical family *Gramineae* The plants are monocotyledonous They have jointed stems with leaves arranged in two opposite rows a single leaf at each joint of the stem In most grasses the stems are hollow, but corn sorghum and a few others have stems filled with soft pith

The leaf is a long narrow blade Its base is a sheath which encloses the stem The flowers are enclosed in glumes or chafflike scales and are arranged in spikes like the wheatheads or in panicles like the oat They depend upon the wind to scatter their pollen and lack color or perfume to attract insects Clovers, alfalfa, and other plants which are used for hay are often called grasses although they are not true grasses

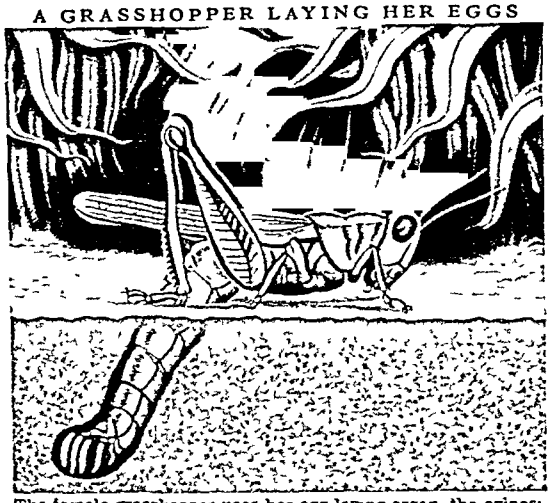
GRASSHOPPER A greedy appetite for most of the things people grow in their fields and gardens gives grasshoppers a bad reputation Farmers know them as one of the worst insect pests When grasshoppers migrate in great swarms eating all green plants in their path they are called *locusts* The 17 year 'locust,' however, is not a locust but a cicada (*see* Cicada)

Scientists call the big brown, yellow, or reddish brown insect of this type the 'short-horned grasshopper' because it has two short thick antennae, or feelers There is another insect called the long horned grasshopper It is a small green hopper with two threadlike antennae *each longer than its body It* is more closely related to the katydids than it is to the *locusts (This article* will describe only the true locust or short-horned grasshopper)

The Well Equipped 'Hopper

Children like to catch grasshoppers as they leap over weeds and grasses They also *enjoy watching these* insects spit tobacco juice' The brownish fluid is the grasshopper's defense against some of its enemies The fluid is however, harmless to man In the summer it is interesting to capture a grasshopper and to study it carefully Put the insect in a large glass jar and cover the top with gauze Look closely at it through a magnifying glass

A GRASSHOPPER LAYING HER EGGS



The female grasshopper uses her egg-laying organ, the ovipositor, to drill a hole in the ground an inch or more deep. There she lays her eggs. When hatched, the young are about the size of large ants. As they grow they shed their skins, or molt, several times over a period of about six weeks.

The grasshopper has a long hammer-shaped head. Its great compound eyes, placed high on the head, give the insect an appearance of solemn wonder. It also has three tiny, simple eyes, one in front of each compound eye and one between the compound eyes. Its antennae wave nervously.

Give the grasshopper a green leaf and watch it eat. It holds the leaf between the claws of its two front legs, and bites and chews this food with its two pairs of jaws. The upper jaws, or mandibles, have notches on them. As it eats, the insect constantly taps the leaf with the palpi, or feelers, which are on its lower lip.

This famous jumper has highly efficient legs. The front and middle pairs are short. The rear pair are longer than its entire body. Each rear leg has an upper section, called the *femur*, which has very strong muscles. These muscles give this part of the leg its heavy and braided appearance. The lower part, or *tibia*, ends with sharp spines just before it joins the foot. When the grasshopper is preparing to jump, it digs the spines into the ground and brings the tibia and femur together. Then it suddenly straightens the legs and shoots forward like a released spring. In one hop it can jump 6 to 10 feet. This is from 70 to 120 times the length of its body.

Look at the grasshopper's feet as it climbs up the side of the glass jar. Each foot ends with a pair of sharp claws. Between the claws is a cushion-like pad called the *pulvillus*. It is covered with sticky hairs which permit the insect to climb on smooth surfaces.

Flying, Hearing, and "Singing"

Grasshoppers usually fly only short distances. But when they are forced to migrate in search of food, they can fly "short hops" which total many hundreds of miles. The insect has two pairs of wings. The forward pair are thick and tough and are used only as a protective covering for the filmy rear wings. When the insect is flying with these rear wings, its forward wings are held straight in the air, stiff and motionless. When the rear wings are not in use, they fold up like fans and lie along the insect's back beneath the forward pair.

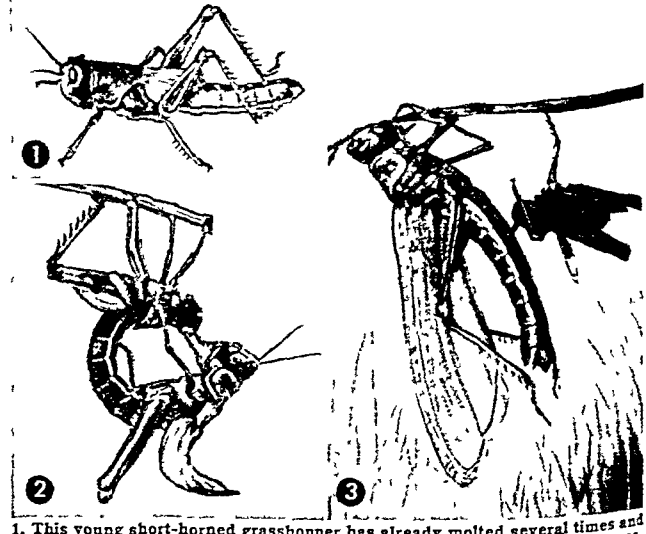
The grasshopper has two ears, one on each side under its wings, on the first section of its abdomen. Each ear is a round hole covered with a clear thin membrane which serves the same purpose as the human eardrum. One kind of grasshopper "sings" by rubbing its rear legs together. Another kind rubs its legs against the tough wing covers. As a grasshopper flies up out of a field, it makes a crackling sound by rubbing its back and front wings together.

Egg Laying, Hatching, and Growing Up

Grasshoppers lay their eggs in the late summer and fall of the year. At the end of the female's body are four short thick prongs. The upper pair curve upward, the lower pair bend downward. With these prongs she bores a hole one to two inches deep in the soil of fields and grassy areas. Then she spreads the prongs apart and deposits the eggs in the hole in a mass of from 6 to 150. She covers the eggs with a frothy substance which hardens and forms a protective pod around them. The pod also provides air space for the young 'hoppers when they hatch underground.

Each egg pod is $\frac{1}{2}$ to $1\frac{1}{2}$ inches long and $\frac{1}{8}$ to $\frac{3}{16}$ of an inch in diameter. The pod's outer surface is usually covered with bits of soil, gravel, and roots. The female lays several egg masses with their protective pods, each in a separate hole. She may lay as many as 12 to 21 pods a season.

HOW THE GRASSHOPPER GETS ITS WINGS



1. This young short-horned grasshopper has already molted several times and its wings are just beginning to appear. 2. In the fifth and final molt the grasshopper, with wings fully developed, leaves the old skin. 3. The new wings have dried and opened out to their normal size. Near by hangs the *old skin*.

CONTROLLING ONE OF THE FARMERS WORST PESTS



With the coming of winter the adult grasshoppers die and the species passes the winter in the egg stage When the hoppers hatch in the spring they quickly work their way to the surface and shed the membrane which covers them They are funny little fellows about an eighth of an inch long with big heads long legs and no wings They begin to eat greedily of green plants and to grow rapidly Five times over a period of about six weeks they burst out of (molt) their skins After the fifth molt they are adults and their wings bodies and legs are fully developed

Grasshoppers undergo *incomplete metamorphosis* that is the baby hopper does not start life as a larva and go through a quiet pupal stage It is similar in appearance to its parents

Many Natural Enemies

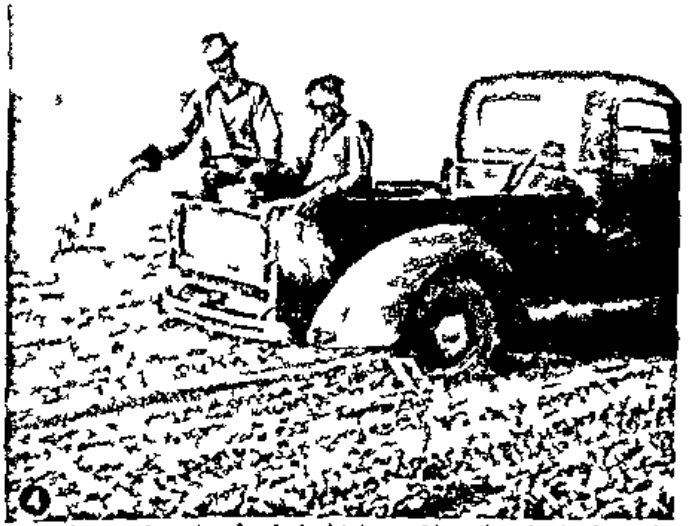
Grasshoppers have many natural enemies Without the help of these enemies men would find it more difficult and expensive to control the pests Flesh flies deposit their maggots on grasshoppers The female fly gives birth to living maggots instead of eggs She attacks the grasshopper usually when it is in flight and attaches the maggots to its body

Blister beetles carabid beetles and bee flies lay their eggs in the soil close to grasshopper egg pods When the fly larvae hatch they work their way into the grasshopper pods and eat the eggs Birds eat countless grasshoppers and some eat the eggs after scratching them out of the ground Ground squirrels and field mice also eat the insects and their eggs Yet these enemies have not prevented grasshopper plagues

Plagues and Control Measures

Short-horned grasshoppers or locusts are among the world's worst insect pests Wherever green plants grow they may appear in great numbers The Bible says that they were one of the ten plagues of Egypt As early as 1797 they damaged crops in New England

The plagues of 1874 and 1877 were national disasters Great swarms of grasshoppers originated in the plains east of the Rocky Mountains They spread to the Mississippi Valley and southward into Texas They appeared on the horizon like a black storm The roar of their wings was deafening As they settled smaller limbs of trees broke under their weight Railroad tracks became so slippery with their bodies that trains had difficulty in running They ate the family laundry hanging on the line outdoors and invaded houses to chew the curtains upholstery and rugs Their remains polluted the water in wells and creeks When they moved on not a living green plant remained



A grasshopper clings to a head of wheat greedily eating the tender grain (*upper left* *After a swarm attacks a cornfield it is stripped of almost every leaf (upper right* Poisoned bait is the best way to kill the pests Wheat bran sawdust water and poison are mixed together Then from the back of a truck two men scatter the bait by hand over the fields They cover about 20 acres an hour

Grasshopper plagues still occur at least once every ten years in the United States. The Western states of the Great Plains, Rocky Mountain, and Plateau regions are the most severely affected. In these states during the ten-year period 1936–45, grasshoppers caused crop damage estimated at more than 400 million dollars. At the same time, crops valued at some 600 million dollars were saved by control measures.

Since 1934 Congress has appropriated money for grasshopper control. The government provides free bait materials to the states. Each co-operating county issues the poisoned bait to farmers. It is a mixture of bran, sawdust, and sodium fluosilicate. Chlordane or toxaphene may also be sprayed over fields by low-flying airplanes. Fields are plowed in the fall to destroy the eggs.

At least 90 per cent of all grasshopper damage to cultivated crops is caused by five species: the migratory grasshopper (*Melanoplus mexicanus*), reddish-brown, 1 inch long; the differential grasshopper (*Melanoplus differentialis*), yellow with black markings, $1\frac{1}{2}$ inches long; the two-striped grasshopper (*Melanoplus bivittatus*), greenish-yellow with black or brown marks, $1\frac{1}{4}$ inches long; the red-legged grasshopper (*Melanoplus femurrubrum*), reddish-brown above, yellow beneath, with red hind legs, $\frac{3}{4}$ inch long; and the clear-winged grasshopper (*Camnula pellucida*), yellow-brown, 1 inch long.

Grasshoppers belong to the order *Orthoptera*. Short-horned grasshoppers belong to the family *Locustidae* (*Acrididae*); long-horned, to the family *Tettigoniidae*. Western, or Mormon, crickets, which also damage crops, belong to a subfamily, *Decticinae*, of the long-horned grasshoppers.

BATTLING A GRASSHOPPER PLAGUE



These Colorado housewives are sweeping masses of grasshoppers off the steps and front of their farmhouse. Such swarms strip the fields of growing crops and even find their way into homes and barns.

GRASSLANDS. The meat and grain for much of the world's population is produced in grassland regions. About one fifth of the earth's land surface once had a natural cover of grass. The grasslands stretch for hundreds of miles between forests and deserts. Near the forests where rainfall is abundant, trees grow intermixed with tall grasses. Gradually, as the grasslands stretch away from the forests the rain decreases and soil conditions change. Trees are smaller and fewer. Then come vast stretches of treeless tall grass that may stand several feet high. In semiarid regions on the margins of deserts grow short grasses only a few inches tall (*see* Climate; Deserts).

Savannas—Grasslands of the Tropics

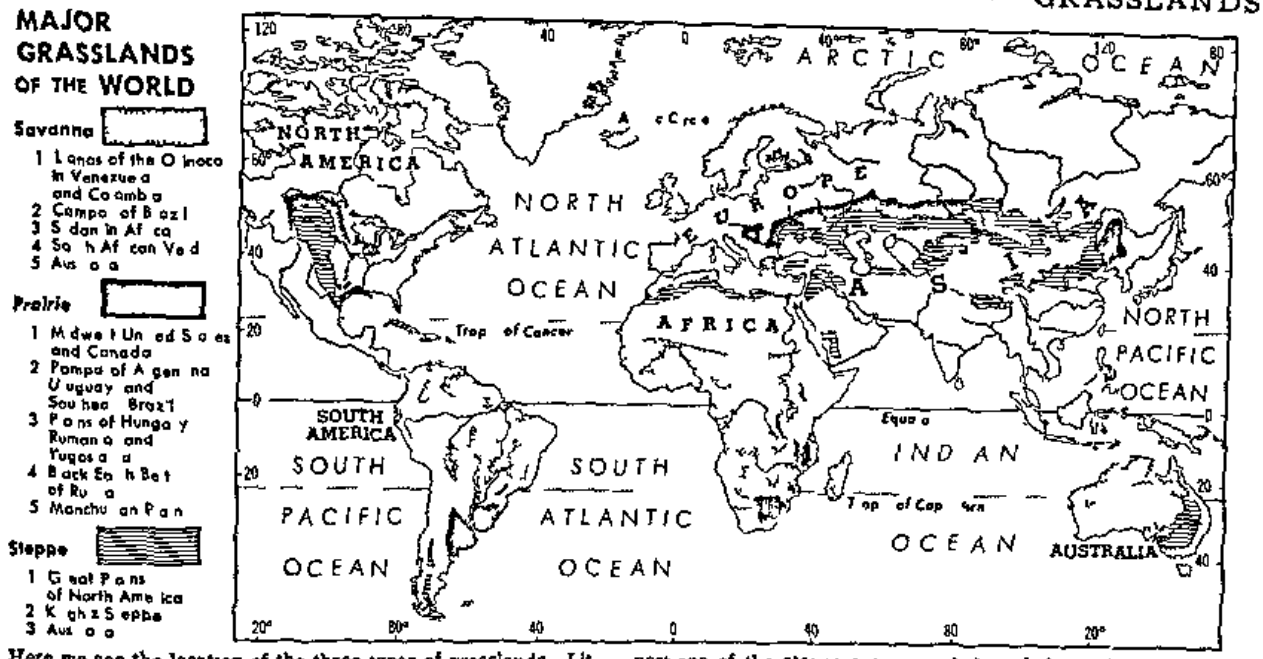
In the low latitudes where there is a distinct dry season lie the tropical grasslands, called *savannas*. Near the edges of the equatorial rain forest, trees are mixed with the grass. Along streams the trees often form arches over the water, called *gallery woods*. As the rainfall diminishes, *scrub forests*, *thorn forests*, and bushes take the place of larger trees and eventually there is only a grass cover. Where savannas border the deserts, the lands are sometimes called *tropical steppes*.

Savanna grasses are coarse and rank-growing. They range from two to twelve feet in height. Young blades of dull green spring up rapidly at the start of the wet season. Most plants grow singly; some in thick bunches. They are separated by bare spots of reddish soil. As the plants mature, the blades grow stiff and harsh. In the dry season, they change to a dusty yellow or brown and slump to the ground.

On the drier margins of the savanna in Africa and Australia, the grass cover is broken by trees of the flat-topped acacia type. In the parklike savanna common in the *llanos* of Venezuela, the *campos* of Brazil, and the Sudan of Africa tall grasses are mixed with low trees and thickets.

Savannas are the natural home of many animals. Grass and the foliage of low trees provide food and shelter for plant-eating (herbivorous) animals. These in turn attract many flesh-eating (carnivorous) animals. Although the savannas of the various continents are similar, the animal life differs widely. The South American savannas have few species of mammals and the animals are small. They include red wolves, pampa deer, jaguars, tapirs, and peccaries. They do not approach the size, beauty, and majesty of the lions, leopards, zebras, giraffes, elephants, buffaloes, and other big game found on the African savannas (*see* Africa). Mosquitoes, ants, ticks, and other insects make life miserable for animals and people of the savanna. Many birds, such as the brilliant-colored parakeets, live among the trees beside the streams, especially in South America.

Most savannas are either plain or plateau but a few are hilly. At the beginning of the rainy season the banks of streams are quickly



Here we see the location of the three types of grasslands Little of the original prairie now bears a mantle of tall grass Instead farmers raise fine crops on its rich soil The moister portions of the steppe are cultivated and the rest is valuable pasture Broad stretches of the tropical savanna remain wild grasslands the home of huge numbers of game animals

flooded In the dry seasons the rivers return to their channels leaving large alluvial flats to dry in the sun The flood plains and deltas with their alluvial soils are the best places for settlements Although savanna soils are generally better than those of the rain forests the land is not very good either for crops or for pasture (*For* soils of the various grasslands *see also* Soils)

Stock raising is the common means of livelihood of the few people who live on savannas The stock suffers from drought heat and pests and is usually of low quality Cattle is wealth to the tribes of the African savanna Overgrazing and grass burning have led to serious erosion of the soil Some of the people plant gardens or fields in the rainy season They raise sorghum millet yams sesame tobacco and short-staple cotton

Tall Grasses and Rich Crops on the Prairies

In the middle latitudes with their wide range of temperatures grasslands bear finer and shorter grasses The *prairie* has tall deep rooted luxuriant grasses usually mixed with a variety of flowering plants The grasses average from one and a half to two feet in height A striking feature of the original prairie of the United States and the Argentine *pampa* was the vast expanse of tall grass billowing in the wind Except for woods along streams the natural prairie is a treeless rolling plain

The prairies in general are in regions in which the annual rainfall averages from 20 to 40 inches with the heaviest fall in summer In the more humid sections there would seem to be enough rainfall for trees Various explanations have been given for the complete dominance of grasses The occasional dry years averaging one in twenty may have withered any young trees present and permitted the hardy grasses to take over Or grass fires started by the Indians or by lightning may have killed the saplings

Prairie soils are among the most productive on earth All the major prairies are today important agricultural areas Here are the world's greatest bread baskets

When settlers came into these areas they disturbed the balance of nature This was especially noticeable in the United States The settlers killed many of the native animals—deer elk fox bear bobcat and others. They plowed up the grasses to plant crops Some animals were wiped out other increased Certain birds—grouse partridge pheasant—were slaughtered and animal pests such as the gopher increased The chinch bug which had fed on native grasses attacked the farmers grain (*See also* Ecology Insects section Insect Pests North America section Plant and Animal Life of North America)

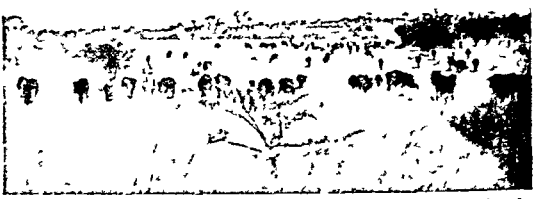
Steppes the Great Pastures

Short shallow rooted grasses often growing in bunches with bare soil showing cover large areas in the middle latitudes where the average annual rainfall ranges from 10 to 20 inches These are the *steppes* usually located on the margins of the deserts Mountain interrupt the pattern so steppes do not border all dry regions In North America the large steppe area coincides with the Great Plains lying between the prairies and the Rocky Mountains and reaching from southern Canada into Texas

The grasses of the steppe are usually only a few inches high Steppe landscape is monotonous In wetter years tall plants may rise above the grass The best of the grassland soils are the *chernozems* found on the border of prairie and steppe They can be cultivated for long periods without using fertilizers if they are protected against erosion



Grasslands of the Argentine pampa are a type of prairie. The expanses of grass on which sheep graze are interrupted by small stands of timber bordering the streams.



On the tropical savannas of Southern Rhodesia, in Africa, the grasses are tall and coarse. In this region of scanty to moderate rainfall, scrubby trees spring up among the grass.

Steppes are the natural home of numerous animals, but there are not as many as on the savanna. As settlers moved in, the native animals, such as the bison, or buffalo, of the Great Plains, were slaughtered. Now man has occupied nearly all the steppes with the plants he has cultivated and the animals he has domesticated.

Land Use in the Grasslands

The population of the world's grasslands has been estimated at about 300 million, or about 12 per cent of the world's total. This is an average of about 25 people to the square mile, but the population is not evenly distributed. Most savanna and steppe areas have far fewer than the average, while the prairies tend to be well settled. (For population, vegetation, and rainfall maps, *see* World.)

Primitive peoples, on the whole, did not use grasslands for crop raising. They had few implements to clear the tall grass and found it easier to make small clearings in the forests. They lacked machinery and skills to bring irrigation to steppes.

It was in the Old World steppe regions that most animals were domesticated. People of the Eurasian grasslands, who learned to depend on their animals, developed a nomadic, or wandering, way of life, as they followed the stock from pasture to pasture (*see* Nomads). Sheep and goats could be raised best in some lands and cattle in others. Horses and camels were found useful for riding and transporting goods. Nomadic life has continued for 25 centuries, but political and economic factors are making it increasingly unsuitable today.

Farming settlements were started centuries ago on the black prairies of Russia. Other prairie lands of the Old World have long been used for farms. In North America the settlers avoided the prairies until the steel plow was invented to break the tough sod. Today the prairies are one of the world's richest agricultural and industrial regions (*see* United States).

Steppe areas here and elsewhere were first used as pasture by cattlemen. Settlers streamed in only after railroads had been built to carry cattle and other produce to market. Farmers succeeded ranchers as huge machines were invented to plant and harvest big grain fields. Often the farmers cultivated regions of inadequate and uncertain rainfall. In dry years winds carried away the soil in immense dust storms. Pasture lands were eroded too as overgrazing destroyed the carpet of grass.

Today efforts are being made to remedy these mistakes and to make better use of the land. Fields are being returned to grass where necessary. Farmers are adopting dry farming and other soil- and moisture-conserving methods. Irrigation systems are being built to supply a dependable source of water. (*See also* Conservation.) Wider use for savanna pasture is promised as stock raisers learn successful methods of exterminating pests and introduce breeds that can withstand heat and disease.

GRAVITATION—*The* FORCE *That* BINDS *the* UNIVERSE

GRAVITATION. Everything on earth tends to fall or to seek a lower position unless it is held up by something beneath it. Even balloons and corks are not the exceptions they seem to be. The air or water is heavier than the balloon or the cork. Thus it tends to push the lighter object upward and flow in to use the vacated space, so reaching a lower level. The force that causes bodies to fall to earth is called gravity. Gravity's pull is always toward the center of the earth. A pebble dropped from a person's hand in the United States falls to the ground in just the way it would fall in Australia, on the opposite side of the earth. In both cases, the pebble falls toward the earth's center.

For thousands of years men have wondered about the workings of gravity. Early Greek philosophers thought of gravity as a force within an object that propelled it downward. "Downward" they thought of as a single direction in space, for they had little idea that the earth was round and that "down" meant toward

its center The great philosopher Aristotle thought that the heavier an object was the more of this force it possessed, and so he said a heavy object must fall more rapidly than a light object Its rate of speed he thought, must be proportional to its weight

Law of Falling Bodies

For nearly 2 000 years this idea went unchallenged Not until near the end of the 16th century did any one try to test the truth of Aristotle s statement At that time the Italian scientist Galileo Galilei began his experiments with falling bodies He did much of this work in the city of Pisa There according to an old tradition he dropped objects of different weights from the famous leaning tower to show that they reached the ground at the same instant Whether he actually did so or not is doubtful but he certainly did prove that objects fall at the same rate regardless of their weight

Galileo may have reasoned in this way Suppose two objects of the same weight and size—say two blocks of iron—are dropped from a height Obviously they will fall side by side at the same speed and will strike the ground at the same moment Suppose then that the blocks are soldered together and dropped again The fact that the blocks are attached will make no difference in their behavior they will fall at the same speed as before Yet now the soldered blocks are really a single object of twice the original size and weight

Through experiments with balls on an inclined plane Galileo proved that falling bodies constantly acquire more speed as they fall The farther an object falls the faster it moves An apple falling from the limb of a tree 16 feet above the ground strikes the ground in one second and one dropped from a tower window 64 feet high strikes the ground in two seconds In other words a falling body drops 16 feet in the first second 48 feet in the next and 80 feet in the third—a total of 144 feet in the first three seconds Every second that a body falls it increases its speed by some 32 feet per second This increase is called *acceleration due to gravity* or *gravitational acceleration* In science it is often designated by the letter *g* The value of *g* as used by physicists is 32 1740 feet (980 665 centimeters) per second in every second The latter phrase is often expressed per second per second or per second squared'

The physicist s formula for the Law of Falling Bodies is $s = \frac{1}{2} gt^2$ Here *s* is the total distance fallen *g* is the acceleration due to gravity and *t* is the time of fall in seconds The velocity (*v*) of a falling body = *gt* The difference of a second or two in the time of falling thus makes a tremendous difference in the speed and the resulting force of impact That is why a fall from a chair to the floor usually does not hurt much whereas a fall from the *roof of* a building may break bones or kill a person

Terminal *Velocity*

Despite the Law of Falling Bodies it is true in a sense that light bodies fall more slowly than heavy ones It is obvious that a feather or a dry leaf falls more slowly than a lead pellet The fact is that the law holds for objects falling *in a vacuum* but not for *objects falling through a fluid such as air or water* A common laboratory demonstration shows the truth of the law The air is pumped from a large glass tube that is closed at both ends Inside are a feather and a lead shot When the tube held vertically is inverted the feather falls to the opposite end as rapidly as the lead shot

Objects falling through a fluid such as air or water are held back by the fluid Resistance by the fluid exerts a force on the falling body opposite to the force of gravity This diminishes the effect of gravity and so slows the fall The resistance is proportional to the amount of surface area the body has In the case of a feather the amount of surface area is very great in proportion to its weight Thus resistance of the air has a greater effect on a feather than it does upon a bit of lead with its small surface area

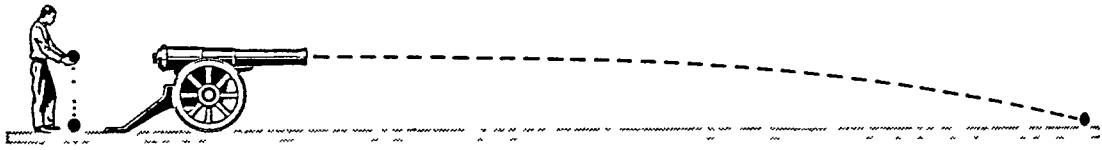
Every object falling freely in a fluid eventually reaches a *terminal velocity* At a certain point in its fall—if the fall is long enough—the object reaches its greatest speed and ceases to accelerate From that point to the ground it falls at an even rate of speed because the resistance increases with the

GALILEO S FABULOUS EXPERIMENT

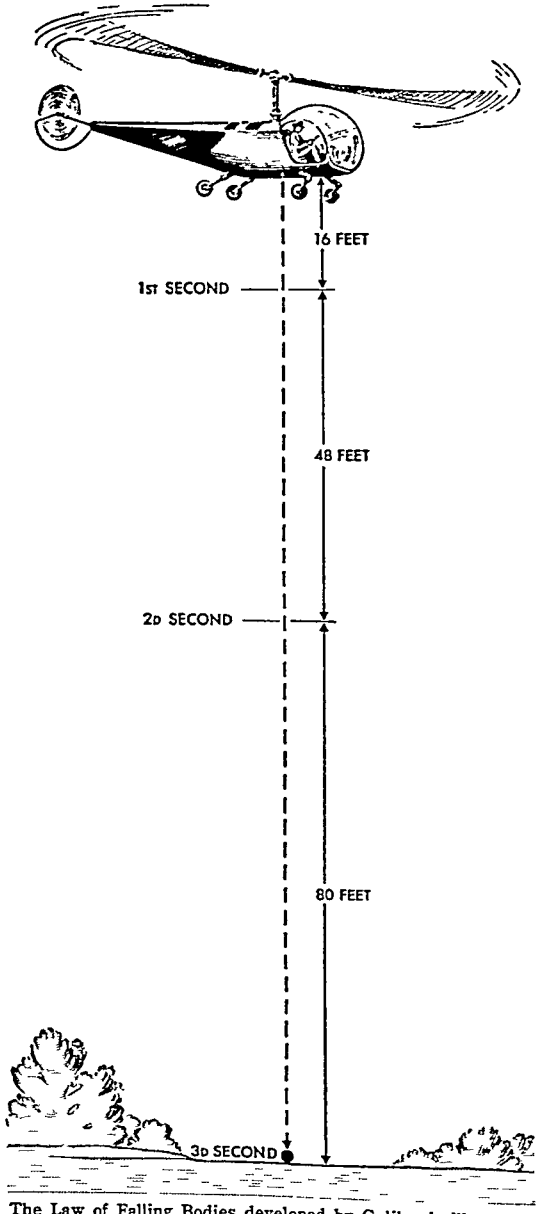


A famous tradition tells how Galileo proved Aristotle wrong by dropping weights from the leaning tower of Pisa. The story is doubtful but it is known that he proved the truth of the matter by experiments he conducted at a nearby university

HOW OBJECTS FALL THROUGH SPACE



The laws of gravity hold whether an object is falling vertically through space or whether it is moving forward as it falls. A cannonball fired horizontally reaches the ground at the same instant as one dropped from the height of the cannon.



The Law of Falling Bodies developed by Galileo is illustrated by dropping a weight from a helicopter 144 feet above the ground. The speed of the weight is increased every second by 32 feet per second. This increase is the acceleration due to gravity.

speed of the falling body and the force of gravity stays constant. Thus a point is reached when the force of gravity, tending to accelerate the body, is exactly equaled by the resistance of the fluid, tending to slow it down. When the two forces are balanced, the body falls at a constant rate, which is its terminal velocity.

Terminal velocity varies according to the object and the fluid medium. A ball bearing falling in heavy oil may reach a terminal velocity of only an inch or so a second. A bit of thistledown in still air falls at a speed of a few inches a second. In water even a stone falls only a few feet per second. A man falling through the air from an airplane may reach a terminal velocity as great as 220 miles an hour (326 feet a second). This is the case if he reaches terminal velocity at 40,000 feet altitude. If he falls to the 5,000-foot level, where the air is denser and more resistant, his velocity will be decreased to about 130 miles an hour.

Universal Gravitation

The same force that causes objects to fall to the earth is the force that holds the earth and the other planets in their orbits. In referring to these large manifestations of the force, we call it *gravitation* rather than *gravity*. Scientists generally use the word gravity only for gravitation at the surface of the earth.

It was the great English scientist Isaac Newton who developed the concept of gravitation. According to an old (and not very reliable) legend, he was walking in an orchard while turning over in his mind the problem of what keeps the moon swinging around the earth in its orbit. Seeing an apple fall from a tree, he asked himself if the force that is felt everywhere on earth might not keep the moon in its course by constantly pulling it toward the earth. Might not terrestrial gravitation be only one manifestation of a universal law of gravitation ruling all motion out to the farthest bounds of space?

Isaac Newton was not the first man to whom such an idea had occurred. The great mathematician and astronomer Ptolemy of Alexandria had surmised something of the kind in the 2d century A.D. Others since that time had had vague inklings of the existence of the great force suspected by Newton. It is a long way, however, from vague surmises to sound scientific theory based on proof, but the materials for such proof had been gradually accumulating

from Ptolemy's time to Newton s Newton attempted to put his theory to the test of calculation but his *results did not* agree with the moon s observed course and he laid the idea as de for years At length more accurate figures were obtained for the distance of the moon from the earth When these figures were used calculation of the effect of gravitation on the moon was found to agree exactly with the moon s course Similar calculations for the other heavenly bod es completed the chain of evidence

Newton s law of gravitation is that *every particle of matter attracts every other particle of matter with a force that varies directly as the product of their masses* and inversely as the square of the d stances between *them* One fact to remember is that attraction *is* mutual While the earth is attracting a grain of sand the grain of sand also attracts the earth The planets pull the sun while the sun pulls tl em

Through the use of the calculus a mathematical method that he invented Newton proved that bodies such as the earth and moon attract each other as if their masses were concentrated at their centers This point is the *center of mass* or *center of gravity*

Every object whatever its shape has a center of gravity The location of this center with respect to supporting structures determines whether the object stays in balance or not The center of gravity of the human body for example must be kept over the feet if a person is to keep from falling A baby learning to walk has great difficulty managing this A *tightrope walker on the other hand* has learned to control his *center of gravity* so sk lfully that he can stand and walk on a th n *supporting wire*

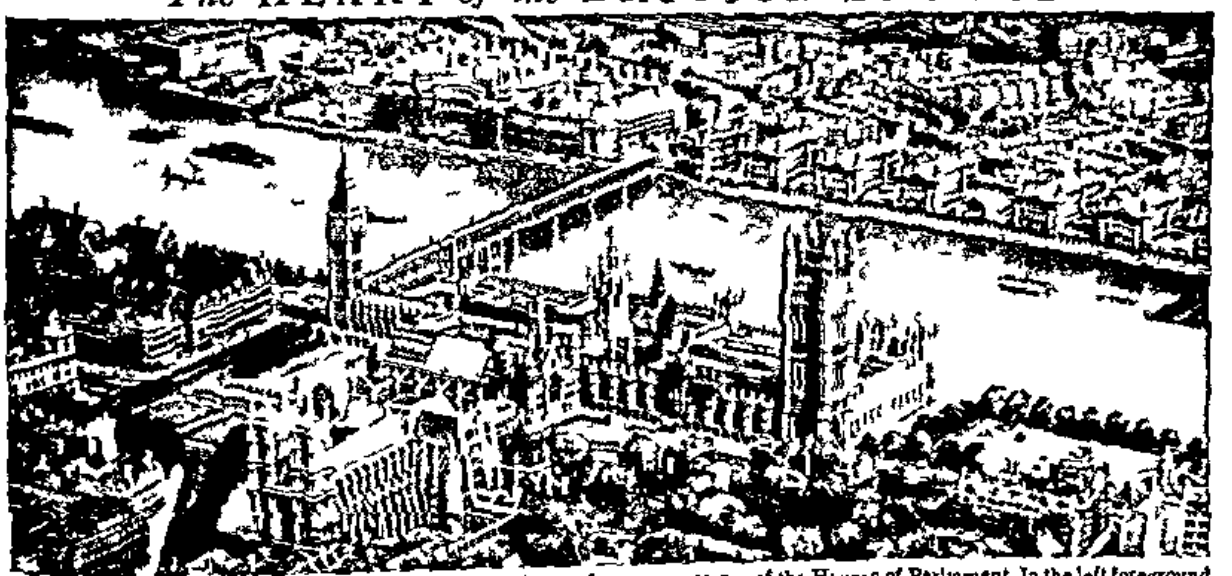
Newton also developed the *concept of mass* as d stinct from *weight* In this concept mass is the amount of matter a body possesses and we ght is the *force imparted* to this mass by the fo ce of gravity The proportion of a body s mass to its volume is its *density* or *specific gravity* These concepts are discussed in the art cle Physics

New Concepts of Gravitation

Until the 20th century gravitation had always seemed to be a fo ce with qualit es that set it apart from other physical forces such as magnetism Unlike magnet m gravitation seems to work equally upon all types of matter

Einstein in his *Generalized Theory of Gravitation* developed the idea that gravitation is only a special case of a much larger concept that includes light motion electricity and magnet sm For Einstein, gravitation was a property of space rather than a force in Newton s sense (see Relativity)

The HEART *of the* BRITISH EMPIRE

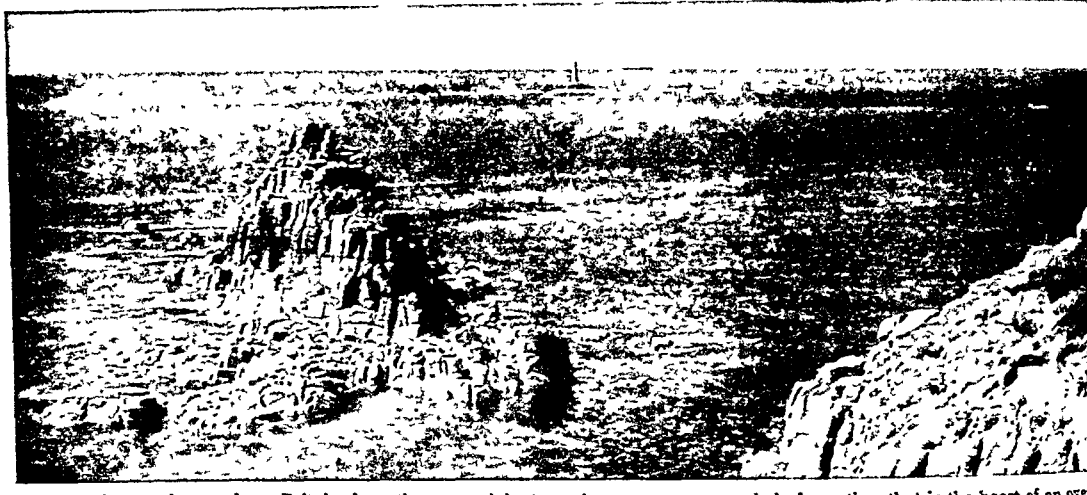


This view looks east from the city of Westminster, the heart of London to Lambeth across the Thames The famous clock tower Big Ben stands at the end of Westminster Bridge and upon a corner of the Houses of Parliament In the left foreground is Westminster Abbey Behind th s famous church stands historic Westminster Hall now part of the Houses of Parliament

GREAT BRITAIN AND NORTHERN IRELAND UNITED KINGDOM OF The long name of the United Kingdom of *Great Britain and Northern* Ireland is usually shortened to *Britain, Great Britain* or *United Kingdom* Americans generally use the terms Britain and Great Britain while the British particularly in offi cial publications prefer United Kingdom

Strictly speaking the name Great Britain should be used only for (1) the island of Great Britain the largest of the Brit sh Isles and (2) the union of nations tl at occupy this island England Scotland and Wales The United Kingdom includes all the territory of the British Isles (except the Republic of Ireland) and in addition the Channel Islands off the coast of France The word *British* refers to all people living in the Unite d Kingdom—Engl sh Scottish Welsh and Irish *Britannia* the Latin name for Britain is used poetically as in Britan-

LAND'S END, THE WESTERNMOST TIP OF BRITAIN



Only in the southwest does Britain face the open Atlantic Ocean. On the last rock to seaward stands Longship's Lighthouse, a proper symbol of a nation that is the heart of an overseas empire built upon ocean commerce.

nia rules the waves." Official documents refer to the monarch as *His (or Her) Britannic Majesty.*

How "Britain" Came to Be

Before 1707 Great Britain was merely the name of the island. The chief country in the island was England. England had added Wales by conquest in 1282. To the north was the separate kingdom of Scotland. In 1603 James VI of Scotland ascended the English throne as James I of England, joining the two countries under a single ruler. For more than a century England and Scotland had separate governments under the same king. In 1707 the Act of Union brought them under a single parliament. The name "Great Britain" was then formally adopted for the united countries (*see* English History). In 1801 another Act of Union brought Ireland into the same government under the name of the "United Kingdom of Great Britain and Ireland." In 1922 southern Ireland became a dominion with its own parliament (*see* Ireland). In 1927 an act of Parliament changed the name to the "United Kingdom of Great Britain and Northern Ireland."

The British flag, called the Union, symbolizes the union of Scotland, Ireland, and England. Before the first Act of Union the flag of England was white, with a large upright red cross; that of Scotland was blue, with a diagonal white cross; and a red diagonal cross was one of the emblems of Ireland. In the Union flag, all three crosses are united (*see* Flags; *see also* England; Scotland; Wales; Ireland, Northern, British Commonwealth; English History; Parliament).

THE UNITED KINGDOM

	Area in Square Miles	Population*
Great Britain		
England (including Scilly Islands and Isle of Wight)	50,874	41,572,585
Wales (including island of Anglesey)	7,466	2,172,339
Scotland (including 186 islands, chiefly the Shetlands, Orkneys, Hebrides, Arran, and Bute)	30,405	5,095,969
Total, Great Britain	88,745	48,840,893
Northern Ireland	5,238	1,370,709
Isle of Man†	221	55,213
Channel Islands†	75	102,776
Grand total, United Kingdom	94,279	50,369,591

*All populations are 1951 census, preliminary.
†For statistical purposes, often included in Great Britain.

REFERENCE–OUTLINE FOR STUDY OF GREAT BRITAIN AND IRELAND

THE BRITISH ISLES

The Land and the Climate

I. **Location and size** B-320, E-346, S-62-3, I-226, I-230*b*: location in world, map W-204-5; in Europe, E-416, E-424-5; political divisions, map B-324-5 (English counties, map E-347; Irish counties, map I-227); air distances, polar projection map A-531

II. **Structure of the land** B-322, maps B-321, E-419: England E-346, 348; Scotland S-62-3; Wales W-3; Ireland I-226-7, I-231, K-40

A. **Coast line and islands:** Land's End, picture G-174; chalk cliffs, picture E-346; Giant's Causeway, picture, I-231
1. Islands: Channel Islands C-185; Hebrides H-327; Isle of Man M-71; Isle of Wight W-133; Orkneys O-425; Shetlands S-148 For Anglesey, Arran, and Scilly Islands, see Fact-Index
2. North Sea N-298

B. **Mountains and plateaus** E-346, 348, S-63, W-3, I-226, I-231, maps B-321, E-419, S-63, pictures E-350, S-64, W-3

C Rivers and lakes E-348 S-63 I 226 I 231 p c tures S-64 K-40 Thames T 110 picture B-309 Avon *picture* S-130 Cam *p cture* E-249 *Loyle* picture I 232

D How the shape of the slands has changed in past ages B-322 327 E-357 Ice Age maps I-6 B-322

III Cl mate B 320 maps E-420 4°9 England E-348 Scotland S-63 Ireland I 226-7 I 231 effect of Gulf Stream G °28*b* I 2 7

People and Act v t es in Great Br ta n and Northern Ireland

I *The Brit sh people* G-173-4 B-322 *th eir origins* E-348 E-357 C-163 diagram R-22 population den s ty map E-419 popula t on growth p ctograph P-371 birth and death rate P 370 pictograph P-372 *immigration and emigration* I-45 *p ctographs* I-46 47 See also the Reference-Outl ne for Races of Mankind

A The Engl sh people E-348-51 pictures E-349 *3o1 351 355* language *E-373-4 E-350 L-98*
1 City life E-350-1 London L-298-307
2 Country life E-351-3 p ctures E-353 S-132 manor houses p ctures A-317 E-349
3 Industrial life E-354-5 I 132-3
4 Education E-353 U-404 E-251 Cambridge picture E-249 Eton W 155-6 picture E-251 Oxford O-432-5 p cture E-250 United Serv ices College *K-48* libraries *L-182-3 184*
5 Recreation and holidays E-350 351 F-5° 59 pictures E-349 bowls B-266 cricket C-511 12 p cture E-351 hunting E-350 p cture E-349 Rugby and soccer F 230 234 wrest l ng W-307 folk dancing F 192*a-b* c the theater D 132-3 T 112 115 Christmas C-296-8 P-440
6 Rel gion E-356 C-303

B The Scott sh people S-63 *63a C-163 O-425* S-148 p ctures S-63*a* 64 language S-63 d a-gram L-98*a* educat on S-63-63*a* U-404 folk tales S-413 folk danc ng p cture F 192*d* gatherings of the clans S-63*a* F 18*a-b* sports (*golf and* curling) G 138 C-530 rel gion S-63

C The Welsh people W 3-4 C-163 language E-374 W-3 folk tales S-413 the *eisteddfod* M-460 W-4

D The people of Northern Ireland (Ulstermen) I 230*b* 231 p cture I 232 rel gion I 230*b*

II Resources and Industr es B-319

A England E-353-5 list E-346 pictures E-354 *355*
1 Agr culture and fisher es E-353-4 F 115
2 M nerals and m ning E-354 chalk p cture M °65 coal p cture *E-354 tin T 137 139*
3 Manufacturing E-354-5 list *E-346 gloves* G 126 iron and steel E-354 S-138 I 218 pot-tery and porcela n *E-355 P-39°b-397 p tures* P-393 394 textiles E-354 T 107 See also art cles on Engl sh c ties *listed below*

B Scotland S-63 63*a*-64 list S-62 agriculture S-63*a* 635-64 pictures S-6° 64 fisher es S-64 A-4 F 117 manufacturing S-63*a-b* E-234 G-118 A-4

C Wales W 3 4 picture W-3 Anglesey (Fact-Index)

D Northern Ireland I 231 B 108 flax and l nen I 142 L-254 picture F 141 *thread T 124*

III Trade trade routes T 166 (Suez Canal S-442) em p re preference or preferential tar ffs I 196 imports and exports see Trade table in Fact-Index
A England E-354 E-372 I 192 193 5 Liverpool L-277 278 London L-306-7 Southampton S-281
B Scotland and Northern Ireland G 118 B-108

IV Transportat on and Commun cat on E-355-6 S-63*b* air routes polar projection map A 531 canals C-108*a* E-355 T 110 L-158 picture B-320 ocean cables map C-5

V Pr ncipal c t es for cities not l sted below see names in Fact-Index
A England E-350 354 355-6 list E-346 London L-298-307 Birmingham B 197 Bristol B-312 Coventry C-502 Dover D-125 Leeds L-158 Liverpool L-277-8 Manchester M 71 New castle-upon Tyne N 138*b* Plymouth P-325 Portsmouth P-377 Sheffield S-138 Southamp-ton S-281 picture E-318 Stratford-on Avon S-42*b* picture S-130
B Scotland S-63*a-b* list S-62 Aberdeen A-4 Ed nburgh E 234 Glasgow G 118
C Northern Ireland I 231 Belfast B-108

VI The arts see in Fact-Index England *subheads* archi tecture arts literature music and the Reference-*Outlines* for *Architecture Language* and *L terature* Mus c Paint ng and Sculpture

VII Government B-320 E-356 D-66 Parliament P 87 9 pictures L-303 P 87 88 how Scotland and Northe n Ireland are governed S-64 I 231

VIII The Br t sh Commonwealth and Emp re B-317 20 See also table in Fact-Index

People and Act v t es in the Republ c of Ireland

I The Ir sh people I 227 8 C-163 farm life I 228 230 language I 2°7-8 I 234 educat on I 2°8 U-404 D 157 literature drama and folklore I °32 234 outline L-99 rel gion I 227

II Resources and industries I 230 list I 226 agricul ture I 228 230 fisheries I 230 peat P 109 I 227 potato P-391 I 230 water power picture I 230

III Trade and transportat on I 230 C-37° C-480

IV Pr nc pal c t es *I 228 list I 226 Dublin D-157* picture I 229 Cobh (Queenstown) C-372 Cork C-480 picture I 229

V Government and h story I 230 230*b* For the h s-tory of Ireland before establishment of the republ c in 1949 see section on history wh ch follows

HISTORY OF GREAT BRITAIN AND IRELAND

—General G 173-4 charts H-364-5 367 England E-357 73 Scotland S-64-5 Wales W-3 Ireland I 230-230*b* I 231 2 See also Reference-Outlines for Middle Ages and the Renaissance and Reformation

Beginnings

I Prehistor c Br tain and Ireland E-357 I 230 Stone and Bronze Ages S-402 B-328 M-66 Stonehenge p ctures E-357 M-66 Celts and *Dru ds C-163*

II From Roman to Anglo Saxon times E-357-8 C-14
A B ta n under Roman rule E-357-8 pictures A-300 E-358 barbarians in Scotland (Picts)

held back by Hadrian's Wall S-64, E-358, picture S-65; Londinium (London) built L-298

B. Christianity introduced C-301: St. Patrick in Ireland I-230-230*a*, P-97-8; Irish immigrants (Celts) bring Christianity to Scotland S-64

Anglo-Saxon Foundations

I. Anglo-Saxon invasions E-358: tribes merge into kingdoms E-358-9, map E-358; Celts enslaved or driven into Wales C-163, W-3, E-358

II. St. Augustine—first archbishop of Canterbury E-359: revival and spread of Christianity C-114

III. Danes invade England and Ireland E-359, I-230*a*, N-294: Alfred the Great A-152, picture E-359; Ethelred the Unready and the *Danegeld* E-359; Canute, king of Norway and Denmark rules England C-117; Harold I H-270

IV. Anglo-Saxon line, restored by Edward the Confessor, ends with Harold II at the battle of Hastings (1066) E-264, H-270, H-279-80, E-359

The Middle Ages

I. Norman kings rule England (1066–1154) E-359-61

A. William I, the Conqueror W-137-8, E-360-1: feudalism and the Domesday Book E-360-1, F-67, W-137; Norman law E-361, L-139

B. William II E-361, W-138: Robert of Normandy and the First Crusade C-519, picture M-238*d*

C. Henry I and Stephen E-361, H-335, S-390

II. The house of Plantagenet (1154–1399) E-361

A. Henry II restores royal power E-361, H-335-6: English begin conquest of Ireland I-230*a*; jury system improved J-367; murder of Thomas Becket B-92; Eleanor of Aquitaine L-318

B. Richard I, the Lion-Hearted R-149-50: the Third Crusade C-520, pictures R-150, C-520

C. King John E-361-2, J-357-8: Magna Carta M-41

D. The rise of Parliament under Henry III E-362, D-65: Simon de Montfort and the Barons' Wars H-336, M-379-80

E. Edward I E-362, E-264-5: Wales conquered (1282) W-3; efforts to unite England and Scotland checked by Wallace and Bruce S-64-5, W-4, B-332

F. Edward II E-265: defeated by Bruce at Bannockburn B-332, S-65: deposed by Parliament E-265

G. Life in medieval England E-362-3, pictures M-238*a-c*, 238*e-g*: knighthood and chivalry K-55-7

H. Edward III (1327–77) E-265, E-363: Scotland's independence recognized S-65; Parliament separated into two *houses* (1340) P-88, D-65; Black Death sweeps Europe B-203, E-363; Wycliffe W-314, R-91

I. The Hundred Years' War begins (1337) E-363, H-445-6: Crécy (1346) H-445; Calais surrenders to the English (1347) C-18; Black Prince at Poitiers (1356) H-446

J. Richard II, the last Plantagenet E-363, R-150-1: Wat Tyler's Rebellion T-227-8

III. The Lancastrian kings (1399–1461) L-91, H-336

A. Henry V H-336: battle of Agincourt (1415) A-56, H-446, picture H-337

B. Henry VI H-336-7: final battles of the Hundred Years' War H-446; Joan of Arc J-355-6, picture H-447

IV. The struggle between Lancaster and York—the Wars of the Roses (1455–85) E-363, R-232-3: end of the Middle Ages in England E-363, R-233

A. Edward IV and Warwick the "Kingmaker" E-265-6, R-232

B. Edward V E-266: murder of the boy princes in the Tower of London R-151, picture E-365

C. Richard III E-363, R-151: battle of Bosworth Field (1485) ends Wars of the Roses R-232-3, R-151

D. Henry of Lancaster weds Elizabeth of York and founds Tudor dynasty as Henry VII R-233, H-337

The Early Modern Period

I. The House of Tudor (1485–1603) T-203, E-364

A. Henry VII H-337, E-364: the English Renaissance M-391 (literature E-376*a*); curbs power of Irish Parliament I-230*a*; Star Chamber S-232; Cabot's voyages to the New World C-8-9, A-190, map A-189

B. Henry VIII E-364-5, H-337-8: the English Reformation E-364, C-303, R-93, H-338; Thomas More M-391-2; Cardinal Wolsey W-181-2

C. Edward VI E-365, E-266: Lady Jane Grey G-215

D. Mary I restores Catholicism M-105, E-365

E. The Golden Age of Elizabeth I E-365, E-332-3

1. The Reformation in Scotland S-65: Mary Stuart M-106-7; John Calvin C-49; John Knox K-63
2. Voyages and explorations E-365, A-190: Drake D-128-9; Hakluyt H-246; Hawkins H-293-4; Raleigh R-72-4, N-278
3. Defeat of the Spanish Armada (1588) E-365, A-372-3, E-333: Philip II of Spain P-191
4. Literature and drama E-376*a-7*, T-112, D-132: Bacon B-11-12; Jonson J-363; Shakespeare S-118-32; Spenser S-337-8
5. The Church of England E-365

II. Birth of the British Empire E-365-6, B-317

A. Stuarts succeed Tudors—James VI of Scotland rules England as James I E-365-6, J-292-3, S-432, S-65

1. Guy Fawkes and the Gunpowder Plot E-366, F-46
2. Alienation of the Puritans P-443, M-145
3. Settlements in America A-192, 193*a*, 206, B-317: Jamestown J-293, S-200-1; Plymouth P-325-7, M-145-7

B. Charles I E-366, C-190-1

III. England's Civil War E-366, C-191: battles of Marston Moor and Naseby C-516; Scots aid Puritans S-65; Long Parliament and Rump Parliament E-366, C-516-17, H-254; execution of Charles I C-191, picture E-368

IV. The Commonwealth and Protectorate E-366-7: Cromwell C-516-18; rebellion in Scotland and Ireland S-65, I-230*a*; Parliament recalls Charles II E-367, C-192

V. England under the Restoration E-367-8

A. Charles II C-191-2: Habeas Corpus Act H-239-40; birth of political parties E-367, P-360; wars with the Netherlands E-367, N-121

B. James II and the "Glorious Revolution" of 1688 E-367-8, J-293: Bill of Rights B-145; Toleration Act (1689) P-443; Presbyterianism established in Scotland S-65

C William III, Mary II and Anne E-368 W 138-9 M 106 A 253
D The long struggle with France E-368 F 268 War of the Grand Alliance (King William s War) K-47 War of the Spanish Succession (Queen Anne s War) M 98 Q 11 Treaty of Utrecht (1713) U-420 E-368
E The Stuart pretenders E-368 P-410 William defeats James and the Irish Catholics in 1690 at the battle of the Boyne I 230*a*
F Act of Settlement (1701) provides for Protestant succession to British throne G-66 E-368
G Act of Union of 1707 (Scotland and England) S-65 E-368 G 174

VI Hanovers succeed Stuarts on Br tish throne H 260 E-368-369*c* G-66 7 George I and George II G-66
VII Beginnings of cabinet government—Robert Wal pole Britain s first prime minister C-66 E-368 C-4
VIII Britain s classical age (1740–80) E-369-369*a*
IX War of Jenkins Ear—War of the Austrian Succes sion E-369 A-497-8 L-230 (King George s War and battle of Bloo ly Marsh K 46 G 79)
X Reactionary reign of George III (1760–1820) G-66-7, E 369 369*c* William Pitt earl of Chatham C-198
A Seven Years War B-107-8 (French and Indian War F 285) Wolfe W 181 Montcalm M-378
B Canada ceded to Great Brita n by Treaty of Paris (1763) C 96 S-107
XI American Revolution E-369 R 120-30 Stamp Act S-367-8 Edmund Burke B 358 boundary settlements W 22-3 William Pitt son of Lord Chatham becomes prime minister P 274
XII Wars with revolutionary France E-369*a-b* F-293-4
XIII New textile machines and the steam engine launch Industrial Revolution E-369*a* I 128-34 See also Reference-Outline for Industrial Revolution
XIV Act of Union (1801) creates United Kingdom of Great Britain and Ireland *E-369b G-174 I 230a*

Growth in the 19th Century

I The struggle with Napoleon E-369*a-b* N-8-11, P 274
A Nelson battle of the Nile N 8 N 109 battle of Trafalgar (1805) N 109 10
B Wellington peninsular campaigns in Portugal W-91 battle of Waterloo (1815) W-66
II Britain rules the seas E-369*b* N 91 N 109
III War of 1812 with United States W 11 *picture* M 23
IV Further exploration—the empire expands B-317 E-369*b* map B-318 *India I 68 (Clive C-351 Hastings* H 280) South Africa S-244 C-118 T 175 O-402 Australia and New Zealand A-486 *N 228b* (Cook C-461) Malaya and East Indies *M 60 E-208* West Indies W 97 (Jamaica J 290 Trinidad T 190)
V George IV E-369*c* G-67 Catholic Emancipation Act of 1829 O-337, I 230*a* Peel s police P 110 E-369*c*
VI William IV E-369*c* W 139 Parliamentary Reform Act of 1832 E-369*c* Russell R-255 slavery abolished S-197
VII The Victorian Age (1837–1901) E-369*c-e*, V-469-70 B-319 Victoria s coronation *picture* E-369*d*
A Industrial Revolution gathers *momentum* I 132-3 E-369*d*
B Opium War and Chinese treaty ports C-279-80 Shanghai S-133 Hong Kong H-418-19
C Anti Corn Law League E-369*c-d* Peel P 110
D Crimean War C-513 14 Florence Night ngale N 236
E Further Parliamentary reforms E-369*d e* P 88-89
F Indian Mutiny of 1857 I 68 L-339 D-62 G 9
G Disraeli and imperialism E-369*e* D 105 British control Suez Canal D 105 S-442 Victoria proclaimed empress of India V-470 I-68 Congress of Berlin B 130 D 105
H British policy during American Civil War A 13 *Alabama* claims A 129 *Trent* affair T 186
I Gladstone and the *Irish Question* E-369*e* G 118 I 230*a* Parnell P 91 Chamberlain C-182
J British political influence in Egypt and the Sudan E-278 S-441 Gordon G 141 Kitchener *K 52*
K British and Boers conflict in South Africa S-244-5 Rhodes R-143 Smuts S-202 Boer War B-219 *20* S-245

20th Century Changes

I Rulers Edward VII E-266 George V G 67-8 Edward VIII E-266-7 George VI G-68 Elizabeth II *E-334-334b F-373*
II The Labor party the Liberals and Lloyd George push social legislation *E 369e 370 L-285 6*
III World War I W 215-39 See also in Fact-Index World War I
A How Britain was drawn in E-434 W 216
B The peace and its results W 239-44 E-434 5 League of Nations L-142 Washington and London naval conferences H 267 N 93 picture *H-423*
C Industrial decline and unemployment E-370
IV The Brit sh Commonwealth with n the emp re B-319 economic ties E-371 I 196
V The empire losses B-319 Northern Ireland (Ulster) separated from the Irish Free State I 230*b* I 231 2 Egyptian sovereignty recognized E-278
VI Origins of World War II E-371 Axis aggression E-435-6 Chamberlain appeasement and Munich C 183 E-371, C-536
VII World War II E-371 2 W 245 72 276-84 294 6 Churchill C-306 Montgomery M-380 See also World War II chronology in Fact Index
VIII Britain s Socialist revolution E-372
IX Imperial Britain declines as a world power E-372 3 B-319-20 map B-318 Jordan and Burma gain independence T 167 B-361 Indian Empire dissolved I-68*a-b* P-42 *42b*-43 Ceylon gains dominion status C-180 Israel created from Palestine mandate I 256-8 P-43-7 Republic of Ireland separated from Commonwealth (1949) I 230*b*
X Churchill returns to power in 1951 C-306
XI Elizabeth II crowned queen E-334*b* E-373

BIBLIOGRAPHY FOR GREAT BRITAIN AND IRELAND

Books for Younger Readers

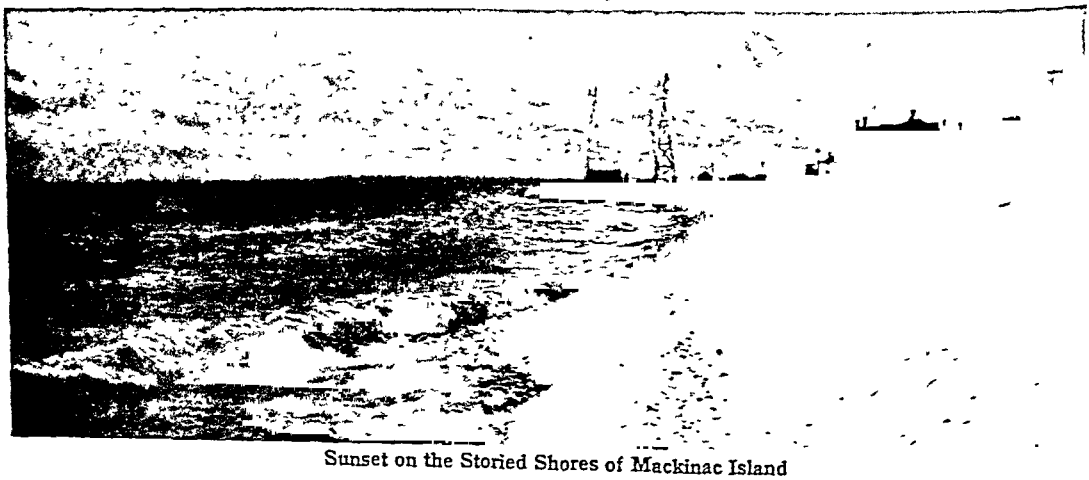
Crawford Marion Little Princesses (Harcourt 1950)
Dolgliesh, Alice Long Live the King! (Scribner 1937)
Dorton F J H. Story of the Canterbury Pilgrims (Lippincott 1914)

Farjeon, Eleanor and Herbert. Kings and Queens (Lippincott, 1952).
Fisher, L. I. Life and Work in England (Longmans, 1934).
Gray, E. J. Adam of the Road (Viking, 1942).
Hosford, D. G. By His Own Might: The Battles of Beowulf (Holt, 1947).
Jewett, E. M. Hidden Treasure of Glaston (Viking, 1946).
Laverty, Maura. Gold of Glanaree (Longmans, 1945).
Quennell, M. C. and C. H. B. History of Everyday Things in England, 4v. in 3 (British Book Centre, 1918–1935).
Sloane, William. British Isles (Holiday, 1946).
Street, Alicia. Land of the English People (Lippincott, 1946).
Williams-Ellis, Amabel and Fisher, F. J. Story of English Life (Coward-McCann, 1947).

Books for Advanced Students and Teachers

Adams, J. T. Building the British Empire (Scribner, 1938).
Brogan, D. W. English People (Knopf, 1943).
Chase, M. E. This England (Macmillan, 1936).
Costain, T. B. Conquerors (Doubleday, 1949).
Costain, T. B. Magnificent Century (Doubleday, 1951).
Creed, Virginia. All About Ireland (Little, 1951).
Cross, A. L. Shorter History of England and Greater Britain (Macmillan, 1939).
Davis, W. S. Life in Elizabethan Days (Harper, 1930).
Finlay, Ian. Life in Scotland (Oxford, 1945).
Galsworthy, John. Forsyte Saga (Scribner, 1922).
Gibbings, Robert. Coming Down the Wye (Dutton, 1943).
Gibbings, Robert. Lovely Is the Lee (Dutton, 1945).
Graves, Robert and Hodge, Alan. Long Week-End: A Social History of Great Britain, 1918–1939 (Macmillan, 1941).
Hamilton, Henry. England, A History of the Homeland (Norton, 1948).
Harvey, G. R. Book of Scotland (Macmillan, 1949).
Johnston, Laurie. Elizabeth Enters (Scribner, 1953).
McInnis, E. W. and Reid, J. H. S. English-Speaking Peoples, A Modern History (Knopf, 1949).
McKenney, Ruth and Bransten, Richard. Here's England (Harper, 1950).
Mais, S. P. B. English Scene Today (Macmillan, 1949).
Mitchell, R. J. and Leys, M. D. R. History of the English People (Longmans, 1950).
Moore, John. Brenshaw Village (Simon & Schuster, 1945).
Ogrizek, Doré. Great Britain (McGraw, 1949).
Peacock, I. C. Her Majesty Queen Elizabeth II (Hutchinson, 1952).
O'Sullivan, Maurice. Twenty Years A-growing (Viking, 1933).
Rowse, A. L. England of Elizabeth (Macmillan, 1951).
Strachey, G. L. Elizabeth and Essex (Harcourt, 1928).
Strachey, G. L. Queen Victoria (Harcourt, 1921).
Trease, Geoffrey. The Seven Queens of England (Vanguard, 1953).
Trevelyan, G. M. Illustrated English Social History: v. 1, Chaucer's England and the Early Tudors; v. 2, Age of Shakespeare and the Stuart Period (Longmans, 1949–50).
Winant, John. Letter from Grosvenor Square (Houghton, 1947).
Woodham-Smith, C. B. Florence Nightingale (McGraw, 1951).

The Five GREAT LAKES *of* NORTH AMERICA



Sunset on the Storied Shores of Mackinac Island

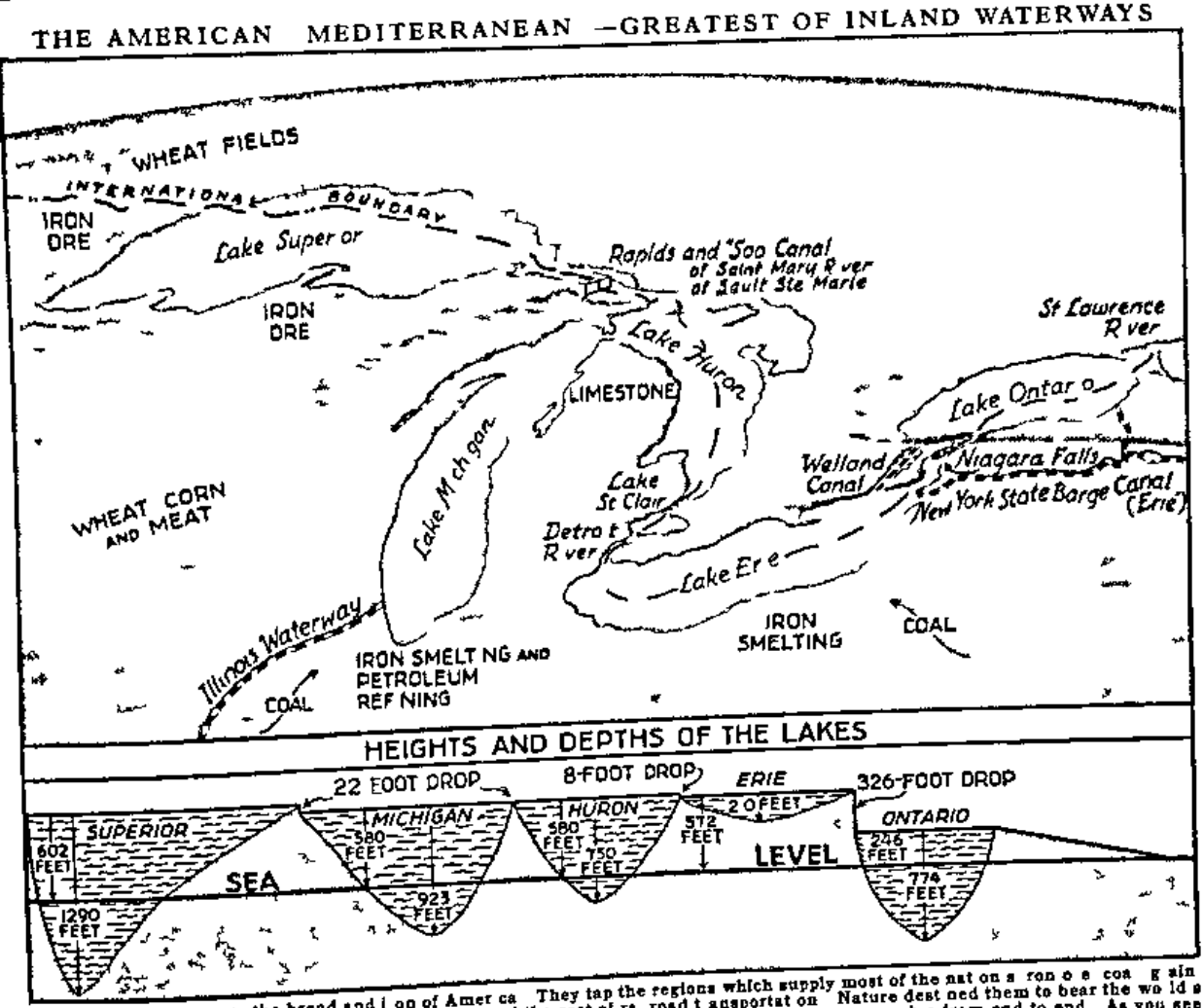
GREAT LAKES. The five huge lakes that lie in the heart of eastern North America form by far the greatest connected area of fresh water on earth. One of them indeed—Lake Superior—*is bigger than* any other fresh-water lake and bigger than any salt-water lake except the Caspian Sea. Put together, the five lakes would more than cover the states of New York and Pennsylvania.

The map at the top of the next page shows that four of the lakes straddle the boundary between Canada and the United States. Only Lake Michigan lies wholly inside the United States. Of the total area, nearly 95,000 square miles, the United States has about 60,000 square miles.

Turn to the table in the Fact-Index under "Great Lakes." It gives the measurements of each of the five Great Lakes. You will notice that Lake Superior is the deepest as well as the largest, Lake Ontario the smallest, and Lake Erie the shallowest. Lake Huron has the longest coast line.

A ship leaving Duluth at the extreme western tip of Lake Superior will travel about 1,160 miles before it reaches the place where Lake Ontario pours its waters into the St. Lawrence River. For a ship leaving Chicago at the head of Lake Michigan, the journey to the St. Lawrence would be about 60 miles shorter. If a vessel skirted close to the shores of all five lakes in succession and returned to its starting point, it would make a voyage of about 8,000 miles and would pass eight states (Minnesota, Wisconsin, Michigan, Illinois, Indiana, Ohio, Pennsylvania, and New York) as well as the Canadian province of

THE AMERICAN MEDITERRANEAN —GREATEST OF INLAND WATERWAYS



These blue waters carry the bread and i on of Amer ca They tap the regions which supply most of the nat on s ron o e coa g sin and meat and transport these products for a fract on of the cost of ra road t ansportat on Nature dest ned them to bear the wo ld s greatest in and commerce for only two ar fi al steps had to be const ucted to make them nav gab e from end to end As you see from the d agram below the only abrupt drops from one ake to another are from Lake Supe or to Lake Huron and f om Lake E e to Lake Ontario The map shows how these obstacles were ove come by the construct on of the Soo and Welland sh p canals

Ontario These eight states have more than a third of all the people of the United States

With their connecting rivers and channels this American Mediterranean forms the world s greatest inland waterway Back and forth across it floats a volume of commerce greater than the entire foreign trade of the United States

The Great Lakes make a series of four downward steps from west to east as illustrated by the diagram under the map on this page The waters of Lake Superior empty through the tumbling Soo rapids into the common level of Lakes Huron and Michigan (*see* Sault Sainte Marie) The next drop is through Lake St Clair and the Detroit River into Lake Erie Then comes the great plunge over Niagara Falls into Lake Ontario (*see* Niagara Falls) Finally the accumulated waters pour through the St Lawrence River to the open ocean 2 350 miles from Duluth

Sources of the Great Lakes

Where does this flow of fresh water come from? What keeps these huge lakes filled year after year? Surely some mighty streams must drain into them But if you look at the map of North America you will see that almost all the rivers of the surrounding regions flow *away* from the Great Lakes Basin To the north and northwest they drain into Hudson s Bay to the west and south they drain into the Mississippi system Only a fringe of small streams and brooks empties into the Great Lakes The 40-mile Nipigon River flowing out of Lake Nipigon into Lake Superior from the north and the slender Muskegon and Manistee rivers of the lower Michigan peninsula are among the largest lake tributaries

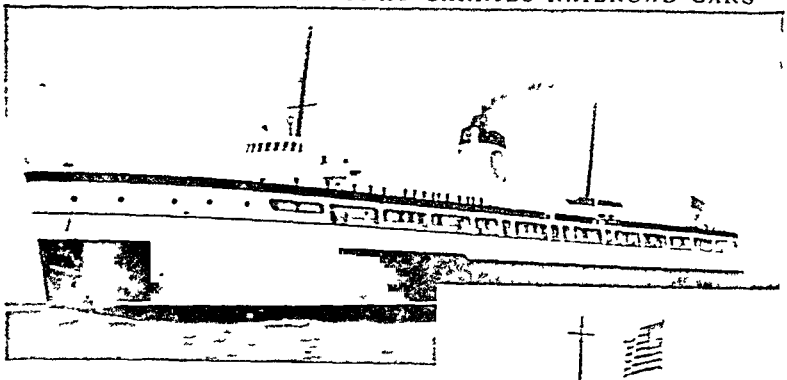
These small streams contribute little The main source of supply is the ground water (water table) that lies close to the surface of the whole Great Lakes region The lake beds are simply basins that dip below the level of this ground water and thus are kept filled by seepage and the flow of innumerable small springs The lakes may be compared to gigantic drainage ponds or rain pools Elsewhere in this region wherever the surface of the lands dips a little

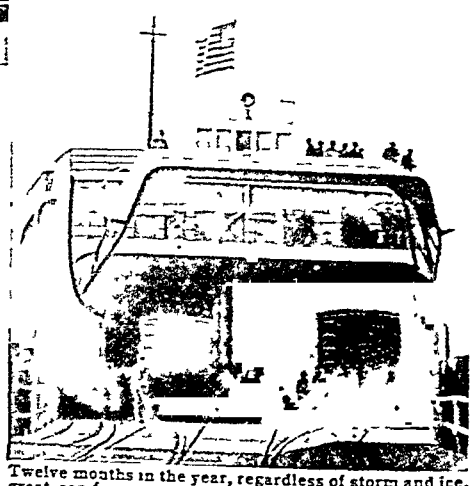
deeper than usual, water appears. This explains the countless small lakes of Minnesota, Wisconsin, Michigan, and the Canadian province of Ontario.

The division is very slight between the land that slopes to the Great Lakes Basin and the land that slopes to the Mississippi Valley. From the same underground water table that supplies the Great Lakes spring also the headwaters of the Mississippi River and its eastern tributaries. It would be difficult to predict whether a drop of rain, absorbed by the soil near the western or the southern lake borders, would find its way out through the Great Lakes to the Atlantic Ocean or down the Mississippi to the Gulf of Mexico.

Since the level of underground water varies with the amount of rain or snow, the levels of the Great Lakes tend to fluctuate considerably in wet and dry years. Over a period of years the difference in level may be as much as 2 or 2½ feet.

A STREAMLINED FERRY THAT CARRIES RAILROAD CARS





Twelve months in the year, regardless of storm and ice, great car ferries carry loaded freight cars across the lakes, saving many miles of travel by rail. They are stoutly built, for they are icebreakers as well as ferries. Some of them have staterooms for passengers.

Natural Environment of the Lakes

Three great tongues of land thrust out among the lakes—the upper peninsula of Michigan between Lake Superior and Lake Michigan; the lower peninsula between Lake Michigan and Lakes Huron and Erie; and the peninsula of southern Ontario between Lakes Huron, Erie, and Ontario. Each of these is ridged in part with low hills.

The borders of the lakes are generally low. In the north they are rocky in many places, but in the south they are mostly composed of sand, gravel, and clay. The forests that once came down to the shores have been largely cleared away for farms and cities or have been thinned out by lumberers. But, in the places where new vegetation has had a chance to spring up and replace the primeval forest, we find an extraordinary variety of flowers, shrubs, and trees. Deer, moose, black bear, porcupine, mink, and muskrat are still plentiful in the more remote sections.

Like all large bodies of water, the Great Lakes moderate the climate of adjoining regions. Lake winds tend to keep the bordering lands cooler in early summer and warmer in early winter than they would be otherwise. On the southeastern shores of Lakes Erie, Ontario, and Michigan and on the Door Peninsula of Wisconsin are extensive orchards and vineyards that owe their existence largely to the tempering influence of the lakes. In the spring westerly winds blowing across the winter-cooled lakes delay the blossoming of fruit trees until danger of frost is past, and, in the fall, warm breezes permit the fruit to ripen before killing frosts come.

On the other hand, the lakes breed sudden fogs and affect the behavior of passing storm centers in a way that is difficult to predict. Strong winds may suddenly whip up the shallow waters along their coasts into high choppy breakers, particularly dangerous to pleasure craft not designed for rough weather. In winter, the storms that sweep the lakes match in destructiveness those of the Atlantic coast.

Economic Importance

The Great Lakes have played a unique part in the development of North America's natural resources. They connect the rich agricultural and mining regions at their western extremities with the great industrial areas and large population centers of the East. More than 100 million tons of freight pass through the Detroit River in an average season. The canals at Sault Sainte Marie carry more cargo than any other canal system in the world—in some years more than the combined tonnage of the Suez and Panama canals. Moreover, this tremendous traffic is moved in a season limited to about eight months. Ice closes the lakes and channels to all but ice-breakers from about mid-December to the last of March.

Lake transportation is far cheaper than rail. The prosperity of the American iron and steel industry depends very largely on the fact that the lakes bring together the raw materials for steel making at a minimum cost. On the borders of Lake Superior lie the world's greatest iron mines—the famous Mesabi, Gogebic, and other ranges of northern Minnesota, Wisconsin,

NORTH AMERICA'S GREATEST WATER HIGHWAY



The Great Lakes form a vast inland waterway for eight states and Canada s province of Ontario Ships from the many lake ports may also reach the Atlantic Ocean and the Gulf of Mexico through connecting rivers and canals The Lake Superior region produces most of the iron ore mined in the United States and the greater part of this is shipped in lake steamers

and Michigan These supply about four fifths of the iron ore mined in the country From Duluth and Superior the ore is shipped for slightly more than a dollar a ton to Gary Ind on Lake Michigan and to Lake Erie ports These ports serve the steel districts of Ohio and Pennsylvania Limestone—needed in steel making—is shipped from Calcite Alpena and Port Inland near Manistique in Michigan

West of the lakes lies one of the most important grain-producing regions in the world It includes a large part of the wheat-raising areas of the United States and nearly all the wheat territory of Canada Without cheap lake transportation the farmers of these regions could not reach their foreign markets on a competitive basis with the farmers of Argentina or Australia where distances to the seaboard are not so great Port Arthur and Fort William on Lake Superior are the outlets for the Canadian grain The Duluth Superior harbors on Lake Superior and Chicago and Milwaukee on Lake Michigan are the outlets for the grain of the United States Like great funnels these ports gather in the wheat of the Northwest an average of 300 million bushels a year, to pour it out again at Buffalo and Montreal And the cost is only a fraction of what it would be by rail

The factories and railroads of the northern Middle West are powered in great part with coal from the eastern Appalachian fields Much of this coal is carried by boat from Toledo and other Lake Erie ports to Duluth-Superior This method is slightly cheaper than shipping by rail The ships return with cargoes of wheat and iron

The Lumber and Oil Traffic

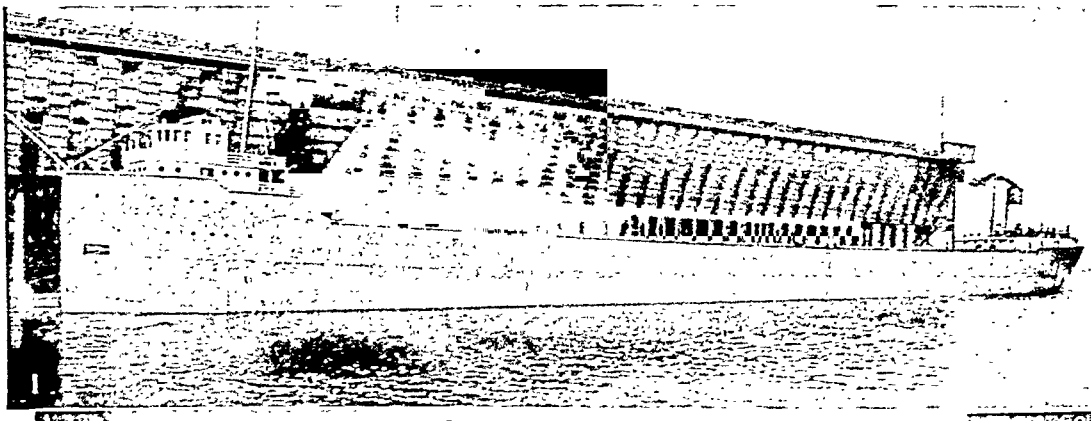
Lumber and lumber products once the most important cargo on the lakes, are dwindling as the surrounding area is being stripped of its most valuable timber Petroleum, on the other hand is increasing in lake commerce Most of it is shipped from the refineries at Indiana Harbor on Lake Michigan to Detroit and Lake Erie ports Besides this 'bulk freight" there was once an immense volume of 'package freight'—manufactured articles and raw materials Most of the ships for this type of freight were requisitioned during the second World War for use on the ocean

Channels of Navigation

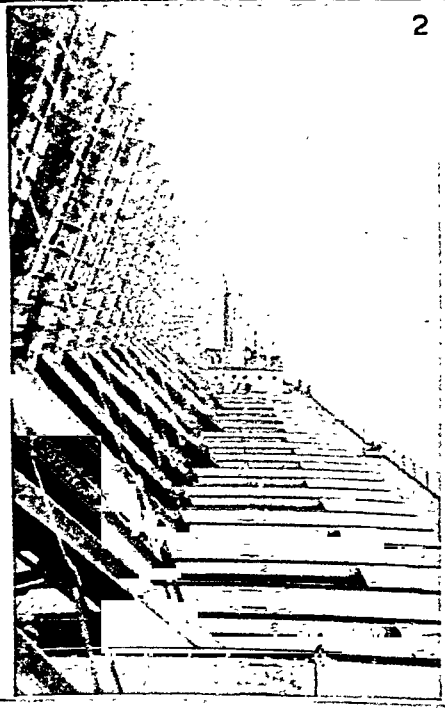
To make the lakes navigable from end to end, work had to be done at only two important points Canals and locks had to be built in the St Marys River, and the Welland Ship Canal with its seven locks had to be dug around Niagara Falls (*see* Welland Ship Canal) The channel through Lake St Clair and the Detroit River has also been deepened, but locks are not needed

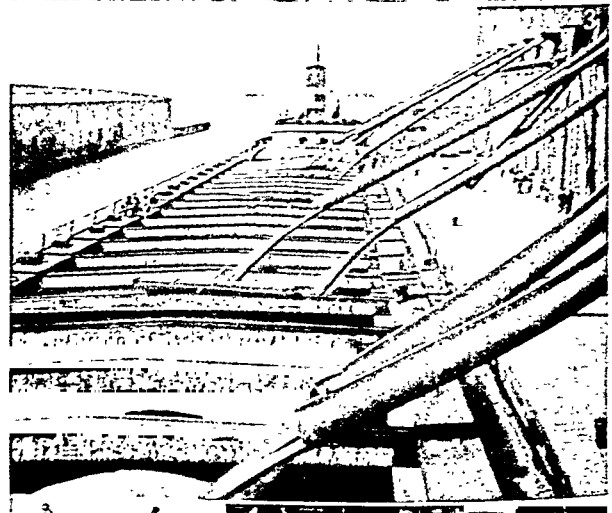
Today the main routes of navigation, the connecting passages, and the principal harbor channels are nor

SHIPS AND CARGOES OF THE GREAT LAKES

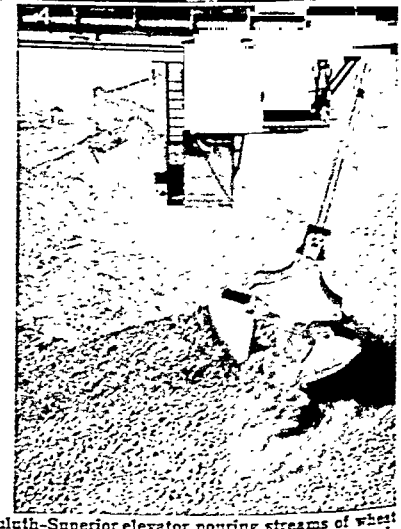


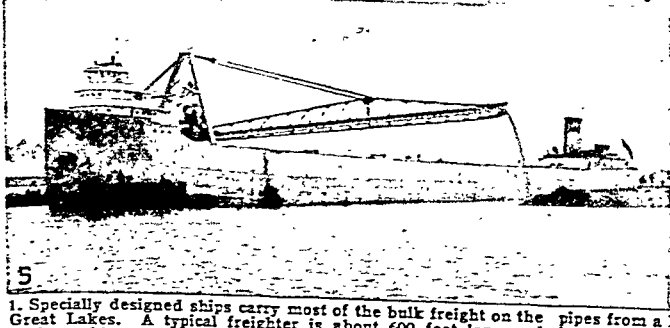
2







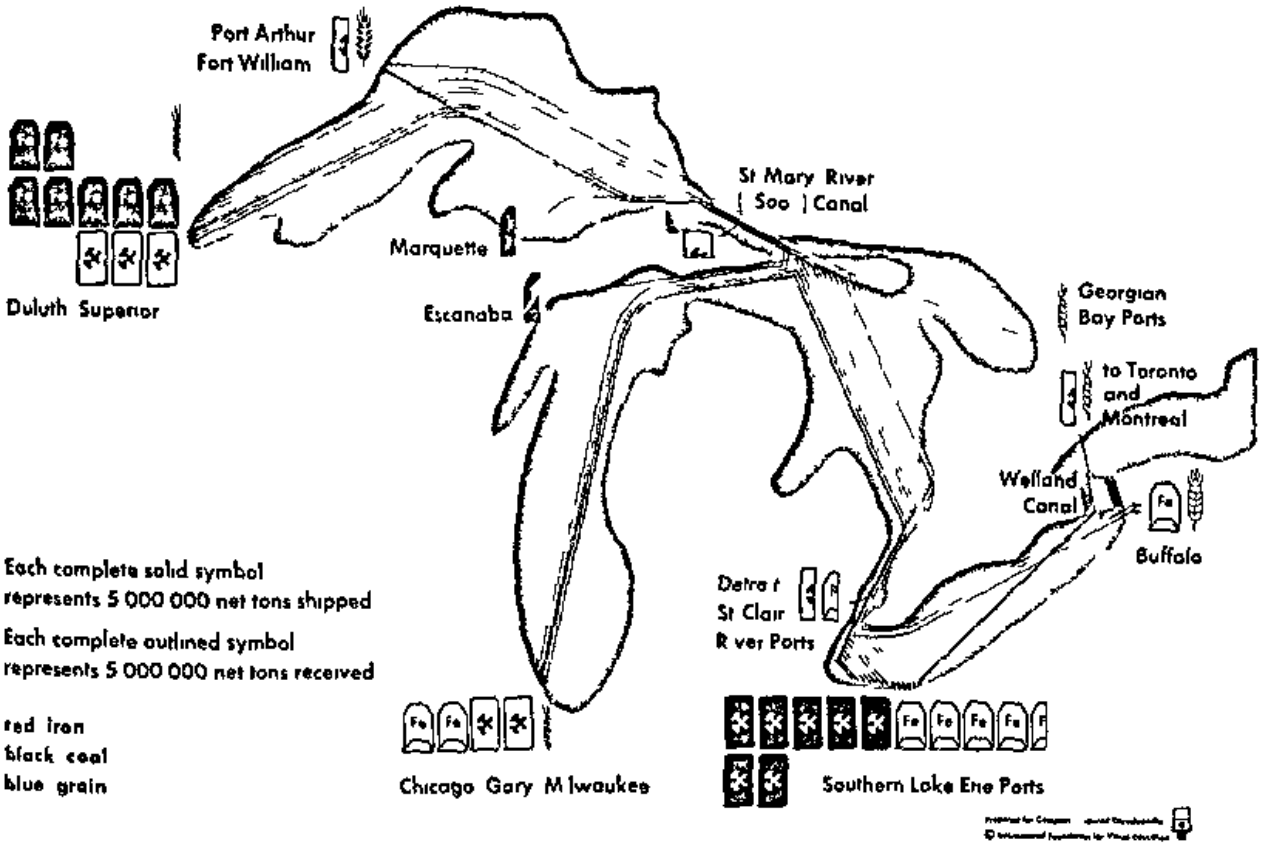




5

1. Specially designed ships carry most of the bulk freight on the Great Lakes. A typical freighter is about 600 feet long and 60 feet wide, with a carrying capacity of 11,000 tons. In the extreme bow are the navigating and living quarters; in the extreme stern, the engines. Between the two is a single huge cargo space. The ship in our picture is alongside an ore-loading dock at Duluth. 2. Here we are looking toward the stern of the ship. The spouts from the storage pockets on the dock are lowered through the ship's hatches to pour the iron ore into the hold. A ship can thus load 10,000 tons of ore in two hours or less. 3. This picture shows pipes from a Duluth-Superior elevator pouring streams of wheat into a grain ship. 4. Ore boats bring back coal from Pennsylvania on their return voyages. Here a giant clam-shell scoop carried along on overhead tracks is unloading coal at Duluth. 5. To serve the lake ports that lack swift cargo-handling machinery, many freighters carry the kind of self-unloading equipment shown in this picture. Endless belts and bucket conveyors travel through the hold of the ship and out along that great swinging boom. The flags pictured above symbolize the peaceful sharing of the Great Lakes waterways by the United States and Canada.

Principal Commodities and Routes in Great Lakes Shipping



Iron and coal make up by far the largest part of the "bulk freight" Iron ore from the mines of Minnesota Wisconsin and Michigan is loaded at the twin ports of Duluth and Superior at the western end of Lake Superior and carried to the great iron and steel plants on the other lakes—to Milwaukee and the Chicago Gary region to Detroit to the cities of northern Ohio and to Buffalo Marquette and Escanaba are other iron shipping points Coal from the Appalachian fields is shipped from Lake Erie ports Most of it moves west to the manufacturing and distributing centers on the other lakes Grain from western Canada and from the Great Plains states of the United States is shipped from western ports to eastern cities for processing and export Since tonnage figures vary from year to year the quantities shown represent a ten year average

mally 20 feet deep or more This means that large ocean going ships could travel the lakes without difficulty when they entered these waters But traffic between the lakes and the ocean is limited by shallow channels The St Lawrence River between Lake Ontario and Montreal forms many impassable rapids, and the canals that have been built around them are limited to vessels of 14 foot draft A proposal that the United States and Canada unite in building and operating a larger and deeper "St Lawrence Waterway" has been under discussion for many years (*See* St Lawrence River)

The New York State Barge Canal system—including the historic Erie Canal—links Lakes Ontario and Erie to the Atlantic seaboard via the Hudson River But much of it is *only 12 feet deep* The Illinois Waterway leading out of Lake Michigan through the Chicago Drainage Canal the Illinois River, and the Mississippi to the Gulf of Mexico is limited to barges and steamers of 9-foot draft or less (*See also* Canals, Rivers and Inland Waterways)

Despite their limited facilities, these links with the sea carry a considerable volume of commerce In some years about one-fourth of the grain carried on the Great Lakes finds its way down the St Lawrence and about one tenth down the New York State Barge Canal Bulk sulphur from South America, wood pulp from the Scandinavian countries and many other goods from distant lands are brought to Great Lakes ports by light-draft ocean freighters

Playgrounds and Fisheries

The Great Lakes are one of the nation's largest and most popular recreation areas In summer, luxurious passenger steamers cruise them from end to end, offering all the delights of an ocean voyage for a small sum Millions from the crowded cities of the surrounding territory come for vacations to their sandy beaches cooled by the lake breezes Western and northern Michigan has the most valuable tourist industry in the country, with an annual business running to hundreds of millions of dollars (see Michigan)

One of the most famous vacation spots is Mackinac Island, at the north end of Lake Michigan in the Straits of Mackinac This was at one time one of the important military posts of North America It is famous for its clear air and cool pinewoods, its old fort and its French and Indian traditions from fur trading days Along the southern shores of Lake

Michigan the wind-blown sand dunes with their unique vegetation have been preserved in the Indiana Dunes State Park (*see* Indiana). Beautiful Isle Royale at the west end of Lake Superior is a national park. In Georgian Bay, an arm of Lake Huron, the Canadian government has established the Georgian Bay Islands National Park. Point Pelee National Park, on the Canadian side of Lake Erie, is a famous bird sanctuary in a region of thick and unusual vegetation.

Great Lakes fisheries are a valuable resource. In United States waters alone, fishermen take about 80 million pounds in an average year. Lake Erie and Lake Michigan account for well over half this total. The catch of lake herring leads all others in size, but the whitefish catch is most valuable. The most highly prized Great Lakes fish has always been the lake trout. These fine fish, however, are preyed upon by sea lampreys which have made their way into the lakes, and the lake trout catch has been greatly reduced (*see* Lamprey). Canada and the United States co-operate in combating the lamprey menace.

A Peaceful Frontier

Though about 1,600 miles of the boundary between the United States and Canada cut through the Great Lakes, no forts and no warships guard this frontier. Soon after the War of 1812, the two nations agreed to limit their naval forces to three small ships each on the lakes and one each on Lake Champlain, thus establishing the principle of disarmament which has since prevailed along the entire border between the United States and Canada. The agreement, known as the Rush-Bagot Treaty, was inspired by President Monroe and John Quincy Adams, then minister to Great Britain. It was negotiated by Richard Rush, acting secretary of state, and Charles Bagot, British minister at Washington. It was signed at Washington April 29, 1817, and approved by the United States Senate about a year later.

A LAKE MICHIGAN PLAYGROUND



Pleasure seekers as well as naturalists enjoy the celebrated sand dunes along the southern and eastern shores of Lake Michigan. Here is a rich treasure land of plant life remarkable for its variety.

International questions relating to the use of the waters are referred to the International Joint Commission. This body was created by treaty in 1909 and organized in 1911. The lakes form a natural series of immense storage reservoirs, and the level of each largely depends upon conditions in the lakes above. Any permanent diversion of water, as through the Chicago Sanitary and Ship Canal, might lower the levels of the lakes and the connecting channels, thus making it impossible for ships to load to their maximum draft. It has been estimated that a decrease in depth of only one foot means a loss of $7,000,000 a year to the lake carriers. Hence any changes that affect the level of the lakes concern both nations.

A Gift of the Ice Age

The basins of the Great Lakes were probably scooped out by the Ice Age glaciers (*see* Ice Age). Most geologists believe that the lakes occupy old river valleys, some of which once drained into the Mississippi, and others into the Atlantic across New York and Pennsylvania. The ancestor of Lake Superior, they believe, drained into the Mississippi at a point north of St. Paul. The ancestor of Lake Michigan drained across the site of Chicago into the Illinois and Mississippi rivers. Lake Erie waters emptied into the Ohio, and waters from the Lake Ontario region flowed southeast to the Atlantic.

When the glaciers pushed down from the north, the tremendous moving weight of the ice scoured these valleys deeper and wider. Then the ice melted and left massive beds of drift (sand, gravel, and rock) where the rim of the glaciers had been. These beds blocked the former outlets of the valleys. At the same time, as the weight of the ice was removed, the land rose, commencing in the southwest. This action tilted the surface of the region, so that water tended to flow from southwest to northeast. By the time the ice retreated to northern Canada, all the lakes were draining down this tilt into the St. Lawrence River and the Atlantic Ocean.

But the present outlet through the St. Lawrence River is by no means stable, because the retreat of the ice from off Labrador and Hudson Bay has allowed this region to rise in recent times from southwest to northeast. This is causing a reversal of the older tilting, at the rate of five inches a century every hundred miles or from nine to ten inches at the south end of Lake Michigan. If this should continue unchecked, at the end of a thousand years Lake Michigan would again flow into the Illinois River, for the divide between them near Chicago is only eight feet high today. By the year 3500 all the lakes except Ontario would flow into the Gulf of Mexico by this route. As evidence of this latest rise, geologists point to old shore lines, which lie at a slant with the present water levels.

Three Centuries of History

More than three hundred years have passed since the white man first sailed the Great Lakes. Canoes,

bateaux, and sailing vessels have come and gone Furs have given way to grain and iron, and from the wilderness great cities have risen.

Samuel de Champlain is generally credited with discovering the Great Lakes in 1615 though his interpreter Étienne Brulé had visited Lake Huron several years earlier Champlain followed the famous Algonquin route up the Ottawa River, portaging across to Lake Nipissing and thence down the French River to Georgian Bay and Lake Huron From Huron he portaged east to Lake Simcoe and through a chain of lakes and the Trent River to Lake Ontario

Jean Nicolet in 1634 was the first to explore Lake Michigan's shores, and Father Ménard was the first (1660) to go through Sault Sainte Marie on his voyage to convert the Indians of the Lake Superior region The next year the traders Radisson and Groseilliers coasted along the shores of Lakes Superior and Michigan, returning to Quebec with 60 canoes laden with an immense cargo of furs Erie was the last of the lakes to be reached by white men (1669), owing to the hostility of the Iroquois tribes In 1671 Daumont de Saint Lusson at Sault Sainte Marie took possession of the entire Great Lakes region for France

The first sailing vessel built on the lakes was La Salle s *Griffin*, which was launched on the Niagara River above the falls in 1679 The ship was lost in a storm on Lake Michigan with a valuable cargo of furs Another quarter century passed before the first permanent settlement in this region was established at Detroit by Cadillac in 1701 After the surrender of Canada in 1760, the French flag on the isolated forts and villages was replaced by the British, and after the Treaty of 1783 the American flag waved on all the southern shores. In the War of 1812 several important naval engagements were fought on the lakes, notably the Battle of Lake Erie (*see* Perry, Oliver Hazard)

Soo Canal Opens Lake Superior

The westward movement after the war at first left the Great Lakes untouched Transportation was so difficult that few settlers found their way into the lake region But the opening of the *Erie Canal* in 1825 brought in a stream of *immigration*. Last to be settled was the Lake Superior area When the state of Michigan in 1840 attempted to *obtain a federal* grant of land to build a canal at Sault Sainte Marie, Henry Clay obstructed the measure, *declaring* that the land was beyond the farthest bounds of civilization, if not in the moon' The discovery of iron in 1844, however, gave the impetus to development of this region and in 1855 the first 'Soo' canal opened Lake Superior to the east

Now the miner, the lumberman and the farmer drove out the fur trader who had held un*disputed sway* for 200 years And the frontier forts and trading posts situated at strategic points became the great *industrial* cities of Chicago, Detroit Buffalo, Cleveland, and many others (*See also* articles on each lake, *Furs and* Fur Trade and **Great Lakes** in the FACT-INDEX)

GREAT SALT LAKE. "The Dead Sea of the New World' is so salty that the human body cannot sink in it At Saltair Beach one sees bathers sitting upright in the water with shoulders well out, or lying on their backs *with head and toes* above the surface It is estimated that the lake contains 400 millions tons of common salt. *It is from four to* seven times as salty as the ocean, the saltiness varying with changes in level

The lake is in northwestern Utah, in the region known as the Great Basin This vast depression between the Sierra Nevada on the west and the Rocky Mountains on the east is an *arid region, deprived* of rainfall by the high western mountains and its waters have no outlet to the sea Great Salt Lake is the *largest* of its lakes and the largest west of the Mississippi River Utah Lake drains into it through the Jordan River from the south. Bear and Weber rivers are the largest inlets on the north and east There is no outlet Hence, as the water evaporates it deposits ever-increasing quantities of salt and other minerals

The average area is about 2,000 square miles, the length 75 miles, the width 50 miles, and the average depth only from 15 to 18 feet These figures vary widely with the amount of rainfall The area in 1869 was 2,100 square miles From 1900 to 1904 the lake nearly disappeared much of it becoming a salt desert In 1924 it was so high that engineering works near its shores were threatened By 1935, after the severe droughts of the early 1930 s, it was reduced to an area of 1,200 square miles and to a depth of less than seven feet

The number of islands also varies with the level of the lake When the water is low, some of them become peninsulas Antelope Island, the largest, is used *for* sheep and cattle grazing Several smaller islands are *the breeding grounds of gulls, pelicans herons, and* cormorants Among the few forms of life known to exist within the lake are blue-green algae, a brine shrimp, and two species of brine flies. There are no fish.

Remnant of Lake Bonneville

Great Salt Lake is a remnant of ancient Lake Bonneville Thousands of years ago, the original lake covered ten times the area of the present lake to a depth of 1 050 feet Its waters were fresh, for they found an outlet to the north through Red Rock Pass into the Snake River, thence into the Columbia River and the Pacific Ocean High above the basin of Great Salt Lake on the mountain sides are still plainly visible the shore features of Lake Bonneville—its beaches, deltas, sand bars cliffs, and promontories

Salt is obtained by pumping the lake water into shallow basins and evaporating it in the sun Sodium sulphate is also produced Across the northern arm of the lake is the Lucin railroad cutoff This remarkable engineering achievement includes 30 miles of trestlework and rock fill on the lake bed It eliminates the many curves and grades of the old route and shortens the distance by 44 miles (for picture, *see* Utah) Just west of the lake are the Salt Flats, on which many automobile speed records are made

THE FORESTED SLOPES OF MOUNT LE CONTE



Mount Le Conte is the highest of three peaks in a long mountain of the same name. A memorable trip for many visitors to the Smokies is the climb to the summit to watch the sunrise. Patches of cultivated fields may be seen in the hollow at the right. The mountain was named for Prof. Joseph Le Conte, who helped explore the region.

GREAT SMOKY MOUNTAINS NATIONAL PARK. The Cherokee Indians called the mountains of their ancestral home "Great Smoky" because of the blue-gray haze that veils their rounded summits. Even in brilliant sunlight a pure blue color bathes the distant views, deepening to purple in the shadows of the clouds. Color plays an important part in the beauty of these mountains in Tennessee and North Carolina. In the early summer entire mountain sides flame with pink, rose, and purple rhododendron. The first touch of frost in the fall sets the forested slopes ablaze with yellow, gold, and crimson. And the evergreens on the upper ridges are never greener than when they wear their winter's mantle of snow.

The national park, created in 1930, straddles the crest of the mountains from north to south along the boundary between Tennessee and North Carolina. It is about 54 miles long and 19 miles wide. Since it is within a day's journey of more than half the nation's population, this region of beauty and cool summers has become one of the most popular of the parks.

The Great Smoky Mountains are the highest of the ranges in the Appalachian system (*see* Appalachian Highlands). Within the boundaries of the park 16 peaks rise to more than 6,000 feet. The summits of Clingmans Dome (6,642 feet), Mount Guyot (6,621 feet), and Mount Le Conte (6,593 feet) are popular objectives of hikers and horseback riders. At Newfound Gap (5,043 feet) a broad parking plaza gives motorists the opportunity to enjoy a majestic view. A seven-mile drive known as the Skyway extends from Newfound Gap to within half a mile of the top of Clingmans Dome.

The rocks exposed in the Great Smoky Mountains are among the oldest in the earth's history. They are part of the ancient land mass known to geologists as "Appalachia." From Appalachia came the sediments which were deposited in the shallow seas to the west and later formed much of the interior land surface of the United States. During several mountain-making movements Appalachia was elevated, and its rocks were folded and compressed. Then ages of erosion by wind and water carved them into their present gentle and rounded contours.

Botanists say that this region is the original home of our present-day eastern vegetation. Almost untouched by the hand of man, with abundant rainfall (nearly 100 inches in a year) and fertile soil, plant life has developed in greater variety than anywhere else in the temperate zone. About 150 species of trees have been found. All Europe has fewer than a hundred species. Here are the largest virgin hardwood and red spruce forests in the United States (202,000 acres). There are perhaps 2,000 species of higher plant life. Many make their finest growth in the Smokies, becoming giants of their kind—tulip trees nearly 200 feet tall, with a diameter of nine feet, a wild grape vine whose main stem is five feet in circumference, laurel shrubs 40 feet high.

UPPER LAUREL FALLS



Laurel Falls, above Fighting Creek Gap, foams through a jungle of rhododendron. In early summer masses of rose-pink blossoms provide a colorful setting.

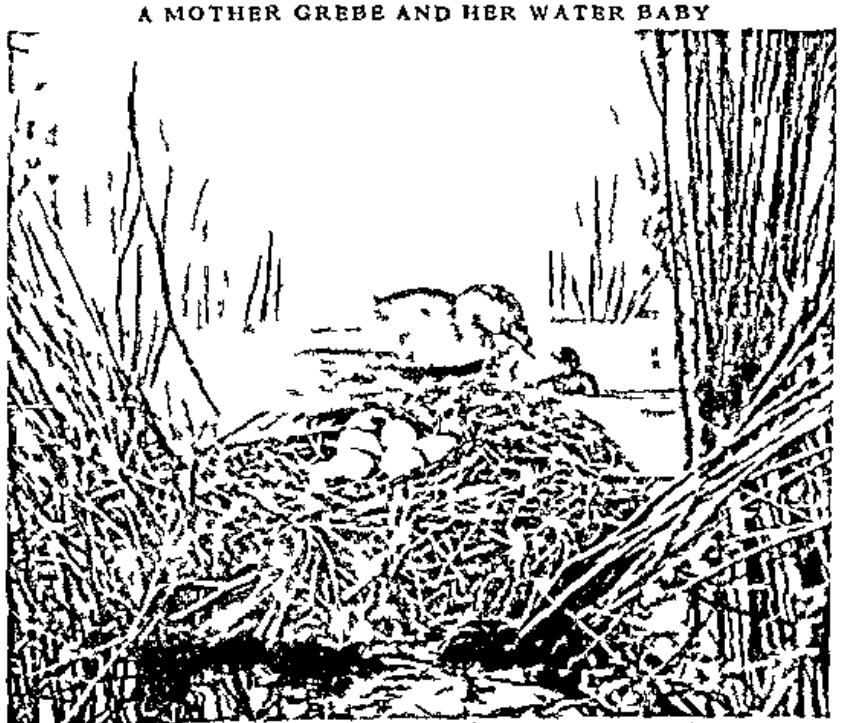
Occasional treeless areas on the rounded mountaintops, locally known as "balds," are covered with grass

and shrubs They may be due to ancient windfalls fire or old Ind an camp s tes which destroyed the trees From these open meadows may be obtaine l the best views of the surrounding mountains Acres of rhododendron laurel azalea and myrtle blanket the lower slopes and the deep ravines cut by rushing streams The growth is so impenetrable that these areas are known as sl cks or hells At the peak of their bloom in May and June the mounta ns are *in lescribably beaut ful*

Animal life also is abundant The Chicago Academy of Sc ences has collected more than 50 species of mammals and a great variety of bir ls reptiles and amphibians Large game such as bear and deer is *increasing* under park laws v ich prohibit hunt ng

Scattered through remote little valleys and bottom la ds are clear ings where mountain fam lies till live in self-s fficient pri i t ve fash on Most of them have been moved out of the park but a few hold life leases from the go ern ment Our contemporary ancestors as they have been called these mountain people are descen dants of English Scotch an l Ir sh settlers who made the r homes in the coves and bottoms of the Smokies before the Rev olutionary War Isolated for generations they have kept alive the speech the ballads and the customs of 17th an l 18th century England Many of the place names in the mountains reflect their picturesque speech—Long Hungry Ridge Chunky Gal Mountain Charlie s Bunion and Sl uckstack Gap The r log cabins their gristmills their artistic weav ng with its ancient traditional patterns their wood working and other homecraft products are be ng preserved as a memorial of a vanishing culture

A MOTHER GREBE AND HER WATER BABY



The t e g ebe was just hatched out of his egg in the float ng nest and has promptly tumb ed into the wate for a sw m The paren s neve go out of s ght of the nest w th out cove ng the eggs wi h decay ng vegetab e matter Th s not on y p otects them f om enemy eyes but keeps them warm so that they wi hatch quick y

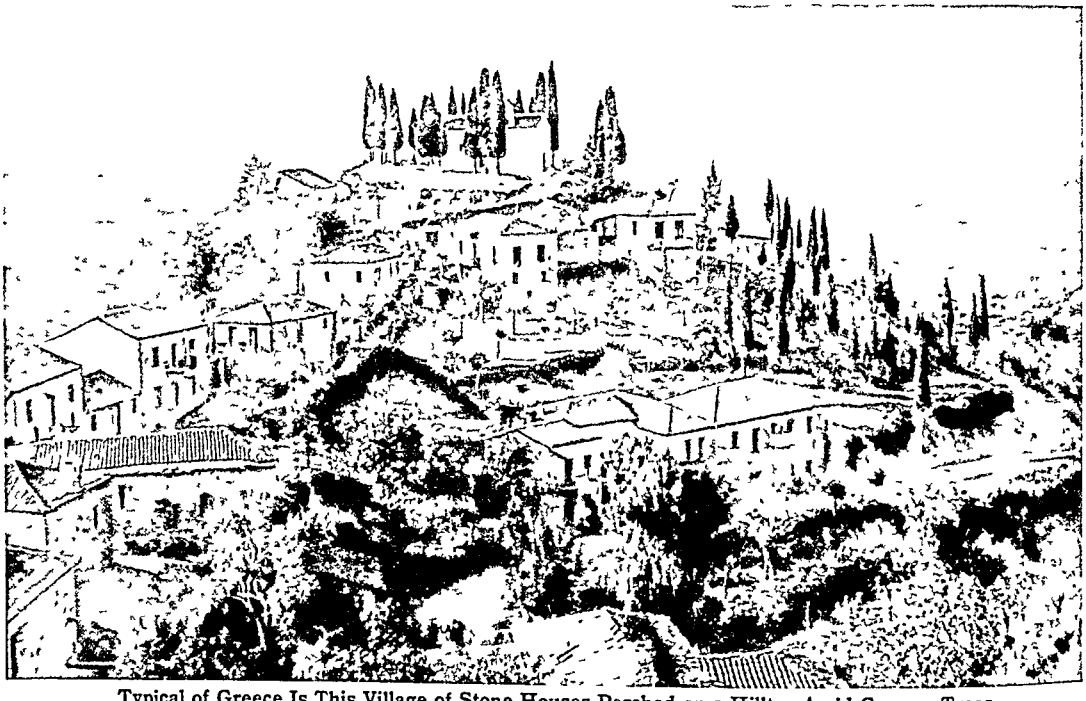
GREBES (*grēbz*) The young grebe is a true water baby When he has pecked his way out of the egg he finds himself on a raft like nest floating among the reeds on the edge of a pond For a few minutes he looks over the edge of the raft and then down he goes swimming with all the skill of an adult But the young birds are weak and the parents often carry them on their backs The chicks ride under the wing coverts with only their bright-eyed heads exposed At the slightest alarm the parents feathers completely hide them The old birds will even dive with the little brood under their wings

Hell-diver and *water witch* are popular names of the grebe for its skill in diving is indeed uncanny Swiftly and silently it vanishes under water to come up far away among the protecting rushes It also has an odd way of tipp ng over backward without leaving a r pple until all but the bill is submerged

On the water grebes look like ducks but they may be *dist nguished* by the r po nted b lls short wings and almost complete absence of tail On land they are *extremely awkward* The legs are placed so far back that when they walk they *carry their bodies* up r ght like penguins Sometimes they wriggle along on their bellies l ke seals Unlike most diving birds, their feet are lobate that is the toes are *united only* at the base each having separate *membranous flaps* Their shanks are flattened to *bladelike thinness* In flight the trailing feet act as a rudder as the tail does in oth er birds They l ave glossy black or brown sh black upper parts black or white throats and wh te under parts The neck is long and the head of the male is ruffed or crested in the breeding season Holboell s eared and horned grebes have chestnut coloring on the head and neck and on the sides of the under parts They feed on fish crawfish and water bugs In winter they desert their reedy ponds and sloughs for more open water and may sometimes be found far out at sea

Grebes form the family *Colymbidæ* of the order *Colymbiformes* S x of the 20-odd known spec es are in North America Most widely d stributed is the p ed billed grebe or dabch ck, wh ch is found throughout North and South America (for picture in colors *see* Birds) The horned and Holboell s grebes range throughout North Amer ca breed ng in Canada and the north of the United States The western and eared grebes range east to North Dakota and Iowa breed ng in the northern part of the r range The Mexican (or Least) grebe ranges from southern Texas to Panama.

WHERE EUROPEAN *Civilization Was* BORN



Typical of Greece Is This Village of Stone Houses Perched on a Hilltop Amid Cypress Trees

GREECE. More than 25 centuries ago European culture had its beginnings in Greece. For nearly 400 years this small peninsula was the center of ancient art, literature, philosophy, and science. Then the lamp of learning passed to other lands and Greece fell into obscurity. In a later section of this article you will read about the glory of ancient Greece and its contributions to our civilization. Here we are concerned with the nation that rose again in 1829 after centuries of alien rule.

We shall see how difficult it has been for a people long oppressed and unaccustomed to self-rule to establish a stable government. We shall observe, on the other hand, how ready they have been to join in fighting fiercely against foreign enemies through a long series of conflicts culminating in the second World War.

A Sea-Girt Land of Peninsulas and Islands

Under a sunlit sky the rugged Greek peninsula stretches southward into the blue Mediterranean. Coastal islands hug the shore, some so close as to form practically a part of the mainland. From the eastern side of the peninsula chains of islands extend across the Aegean Sea and form stepping-stones to the coast of Turkey. To the south and east, the large islands of Crete and Rhodes stand as bastions (*see* Crete; Rhodes). In the extreme north Greece merges into the continent, spreading eastward over southern Macedonia and into Thrace.

Extent.—North to south, about 365 miles; west to east, about 350 miles. Area, about 51,000 square miles. Population (1951 census), 7,631,124.

Natural Features.—Deeply indented mainland coast, with many small islands, especially Cyclades and Sporades groups (including Dodecanese) in Aegean Sea, and Crete. Four fifths of the surface covered by complicated mountain systems, enclosing many small valleys; chief range, Pindus; highest point (in Thessaly), Mount Olympus (9,754 feet). No navigable rivers.

Products.—Wheat, barley, corn, and other cereals; currants, grapes and wine; olives and olive oil, figs, oranges, lemons; tobacco, cotton; sheep and goats; iron ore, lignite, magnesite, chromite, lead, emery; textile and leather manufactures, soap, cigarettes.

Cities (1951 census).—Athens (Athenai), the capital, 565,084; Salonika (Thessalonica), 217,049; Piraeus (Peiraieus), 186,014; Patrai (Patras), 79,014; Volos, 51,144.

The heart of Greece is the deeply indented southern extremity of the peninsula, which reaches down like a stubby hand with crooked fingers. This hand, now called Morea, is so nearly cut off by water from the rest of Greece that in ancient times it was named Peloponnesus (Pelop's Island). A canal dug through the four-mile-wide Isthmus of Corinth now severs Morea from the upper peninsula.

Rugged Mountains Rim the Small Plains

Down the western side of the entire Greek peninsula runs a massive chain of mountains, a continuation of the southern Alps. From this backbone, called the Pindus Mountains, spurs run to the coasts and thrust out into the sea forming the numerous promontories that give Greece its jagged shape. The Greek islands themselves are the tops of mountain spurs that have sunk below sea level. The rivers of Greece are short and swift, useless for transportation. Their small green valleys opening upon the sea are usually cut off from neighboring lowlands by sharp ridges.

A broken coastal plain borders the Ionian Sea on



Practically everyone in Greece lives close to the sea—in the cities and mountain ringed plains that lie along the coasts or on the islands sprinkled over the Aegean and Ionian seas The rugged interior of the peninsula is sparsely populated

the west Larger agricultural areas face the Aegean Sea on the east Here the mountain ringed plains of Thessaly reach north to Mount Olympus the highest point in Greece (9 754 ft) Other fertile valleys lie in the northern continental strip continuing eastward into Thrace

Greece has only 20 inches of rainfall a year and most of it comes in winter Summers are sunny hot and dry Grapevines and olive trees get underground water through their long roots but farmers must irrigate most summer crops Greece can grow subtropical fruits and flowers because there is scarcely any frost except in the mountains The coolest month has a mean temperature of 47° to 50° The reasons for this Mediterranean type of climate are explained in other articles (*see* Climate, Europe)

How the People Live

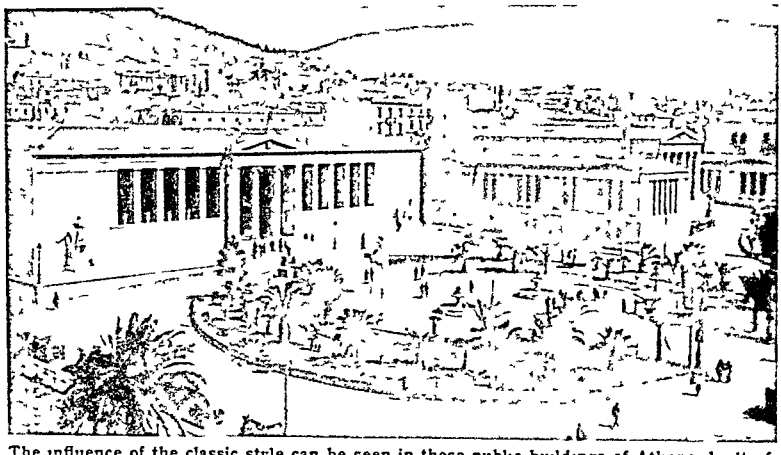
Though only one-fifth of the dry, rugged land can be cultivated, two-thirds of the people live by farming There are only two large cities—Athens the capital with its port *Piraeus, and in the north,* Saloniki in Macedonia (*see* Athens Saloniki) The Greeks are skilled mariners and fishermen and their ships go all over the world The ships carry cargoes for all nations as well as Greek trade

Farm families work hard to grow enough food for themselves and they have little left to sell They use crude plows and oxen to work the thin stony soil and they reap wheat with sickles For centuries they have cut trees from the mountains for fuel, and so many hillsides are bare Heavy winter rains carry the topsoil from the slopes and flood the plains creating unhealthful marshes New trees and shrubs cannot spring up to replace the forests because hungry goats nip off every new shoot

With no great rivers or large-scale irrigation projects, the Greeks must draw water from wells for their summer crops Usually a donkey plods in a circle working a crude water wheel On the more prosperous farms a gasoline engine does the pumping

The farmers cultivate even the smallest patches of poor soil On many mountainsides they have built stone walls to hold the soil level in terraces On some of the small densely populated islands tiny terraces are built up to the very tops of the

MODERN BUILDINGS PRESERVE THE CLASSIC TRADITION

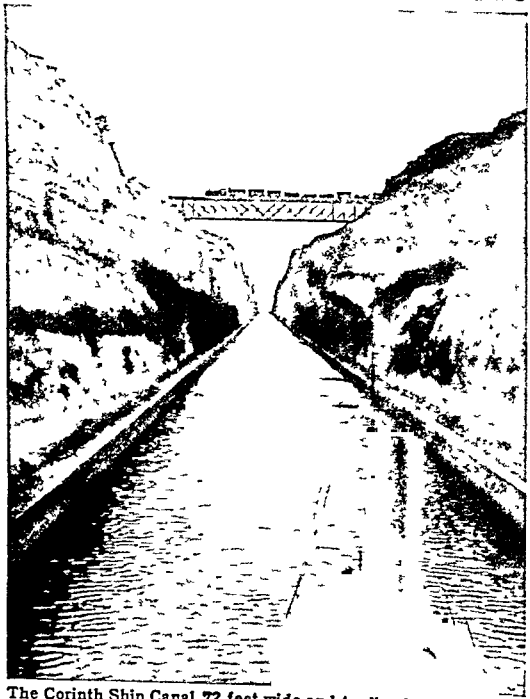


The influence of the classic style can be seen in these public buildings of Athens, built of gleaming marble To the left stands the National University, and to the right the Academy of Science and Art. Behind the University rises Mount Lycabettus.

hills. The plains have an air of ease and luxuriance. But even here the average farm contains only about ten acres of arable land, and of this the peasant must allow some to lie idle each year to recover its fertility. Agricultural methods are primitive and the yield per acre is low.

The whitewashed farm cottages are built around a square which is the center of the social life of the village. Here men gather in the coffeehouse to discuss politics, and women meet their neighbors at the well or fountain, where they come to draw water or to wash their clothes. The fields provide wheat and corn; the gardens, beans and other vegetables. The groves furnish olives and olive oil; the vineyards, wine; and the flocks, milk, fresh sheep's cheese and salty goat's cheese, as well as wool, and goat's hair. Fish largely takes the place of meat in the peasant's diet. Wherever the soil is favorable tobacco is grown for sale. Often there is a surplus of olive oil to take to market or seedless grapes that can be dried and sold as currants.

A SHORT CANAL CUTS GREECE IN TWO



The Corinth Ship Canal, 72 feet wide and 4 miles long, makes an island of southern Greece. Here we are looking through the canal westward from the side of the Aegean Sea.

Because of the practise of including a bit of land in a daughter's dowry, the farms have been broken up into small fields that often lie widely separated. A whole family will sometimes travel miles on mules and donkeys to tend their small vineyard or olive grove or struggle up a distant mountainside to sow or reap a field. Sometimes they camp out for days Grain is planted in the autumn and by May is ripe for harvesting. During the hot summer the plains are parched and the shepherds take their goats and hardy sheep to the cooler uplands, where they must travel constantly in search of the sparse pasture.

A People Proud of Their Past

The peasants have a quality of resignation that comes from their struggle with a niggardly soil, but they have also the gaiety of a people satisfied with simple pleasures. There is much singing and dancing and story-telling. The men are proud of their past—of their heroic struggles for liberty in the 19th and 20th centuries as well as of their heritage from ancient days. Reminders of the great classical age lie all about them, in the matchless Parthenon at Athens and in the temples and ancient cities that have been unearthed by archeologists. Later periods in their eventful history are represented in Roman remains, ruins of castles built by the Crusaders, splendid Byzantine churches, and scores of medieval monasteries.

The people belong to the Greek Orthodox Church, which became separated from the Church of Rome in the 11th century (*see* Church, Christian). They celebrate many saints' days and the important feast days—particularly Easter, which is a day of great rejoicing. On Easter eve the people flock to the churches. At midnight the priest lights a candle to signify that Christ has risen, and its flame is passed on quickly to the candles of all in the congregation. As the people go home to feast on the roast lamb, fish, and eggs they have not eaten during the long weeks of Lent, they greet one another with

the words Christ is risen! and are answered 'Truly He is risen'

Occasionally one still sees in Greece a young man who bears a startling resemblance to an ancient statue of a Greek god but the majority of the people today are of mixed blood The Greeks themselves came down from the north in ancient times and since then successive waves of invaders and conquerors have moved into the peninsula — Romans Bulgars Slavs Albanians and Turks Nevertheless the population shows remarkable unity The various peoples have adapted themselves to the Greek way of life and practically all speak the Greek language

Industries and Foreign Trade

Greece is one of the poorest countries of Europe Although the majority of the people are engaged in agriculture it does not raise enough grains for its own needs Much of its manufactured goods must also be imported for the country lacks the coal and hydroelectric power necessary for a large industry The profits from Greek tramp steamers and liners help to pay for the excess of imports over exports but since the nation was first formed it has had to struggle with an ever increasing foreign debt

The chief exports are Turkish tobacco currants and olive oil Mineral resources are exported chiefly as raw materials—iron ore iron pyrites raw manganese chromites lead ore and emery Lignite is mined and used as fuel The chief products of the factories are textiles cigarettes chemicals olive oil canned goods and wine

War of Independence and Struggle for Territory

For more than 2 000 years from the time of Alexander the Great to the third decade of the 19th century the Greeks passed from one master to another The last of these conquerors was Turkey which established its dominion over the Balkan Peninsula during the 15th century At the beginning of the 19th century when the power of the Ottoman Empire was waning revolts flared up in the outlying provinces

PRIMITIVE FARMING ON THIN SOIL



Oxen plod around a circular stone threshing floor beating out the wheat kernels with their hoofs In the distance narrow terraced fields climb the steep hillsides

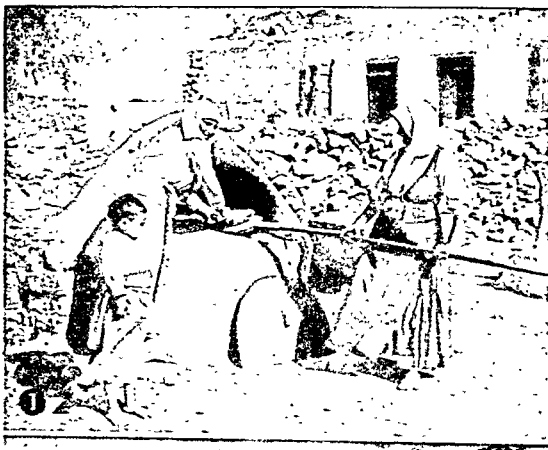
In 1821 the Greeks rose in arms in a war of independence Russia was interested because the Greek Catholic church was also the state church of Russia and Russia had for years *claimed the right to protect the* Greek Christian subjects of the Turkish Empire Numerous volunteers from Europe joined the Greeks—the English poet Lord Byron among them—and fought the troops of the sultan with varying success In 1827 the Turkish fleet was destroyed at Navarino by the combined British, French and Russian fleets but there the joint action ceased The next year Russia marched an army into the Balkans and took Adrianople In the peace of Adrianople (1829) Turkey granted independence to a large part of the Greek peninsula, but millions of Greeks still remained under Moslem rule

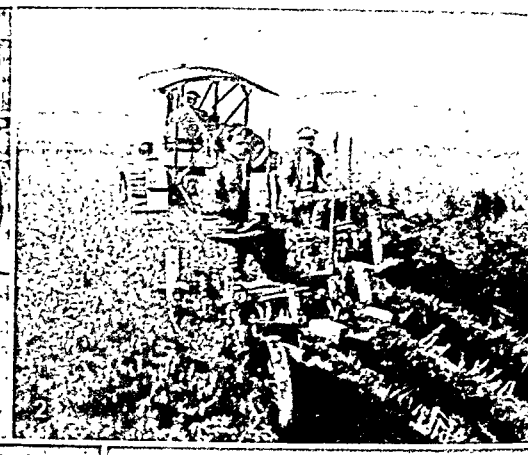
SHEEP GRAZE IN AN OLD OLIVE GROVE



On the beautiful island of Corfu as elsewhere *in Greece* no bit of soil is wasted The scanty grass growing beneath these gnarled and twisted trees affords pasture for a small flock of hardy sheep

GLIMPSES OF PEASANT LIFE IN SUNNY GREECE













1. After the fire has been raked out, the women bake their bread in this clay oven. 2. Two men ride the plows behind a modern tractor. 3. Peasant women and children wait for customers at a roadside market. 4. This fisherman's family will have a squid for dinner. 5. A boy proudly displays the traditional garb of Greece—famous as the uniform of the military corps of *evzones*. Notice the embroidered jacket, the stiff white skirt (called the *fustanella*), and the slippers with great pompons to protect the toes on rough mountain trails. 6. Farmers pause for lunch; some are still wearing old-fashioned tunics.

In 1832 after ser ous disorders and the murder of the provis onal president of Greece the Great Powers provided Greece with a king—Pr nce Otto son of Louis I of Bavaria Otto ruled after the German manner with a crowd of German adv sers and the Greeks in 1862 revolted and deposed h m In the following year Prince George of Denmark took the throne and began h s 50-year re gn The nation now started a long struggle to ex tend its boundaries and l berate the m l hons of Greeks st ll under al en rule In 1864 Great Britain ceded to Greece the Ionian Islands which had been a republ c un der Brit sh protect on s nce 1815 The k ngdom was further en larged by the addi t on of Thessaly on the north between 1881 and 1897 Crete wh ch had revolted from Turk sh rule, was not allowed by the Pow ers to become part of Greece unt l 1913 In the Balkan Wars (1912 13) the allied Balkan States thor oughly defeated Turkey and Greece ga ned a broad strip of territory on the north nclud ng a great part of anc ent Macedonia (*see* Bal kan Pen nsula)

In 1913 K ng George was assass nated by one of his subjects and his son Constant ne ascend ed to the throne His queen was sister to the German Ka ser When the first World War broke out in 1914 the sympathies of the royal family were on the side of the Central Powers But Prime M nister Venizelos a most brilliant statesman who had p loted his country through the Balkan Wars favored the cause of the Allies (*see* Venizelos) In June 1917 King Constant ne was forced to abdicate in favor of his second son Alexander Greece then declared ar and fought th the All es on the Macedonian front (*See* World War First)

In the peace settlement Ven zelos obta ned by the Treaty of Sevres (1920) much new territory for Greece includ ng Eastern Thrace Smyrna and a large ad jacent d st ct n As a M nor But n December 1920 after the death of Alexander from the b te of a pet mon key tl e Greeks de fied the All es by re stor ng Constant ne to the throne The All es therefore de cl ned to support the Greeks n en fo c ng the r ne cla ms n Asia M no —cla ms wh ch n fact exceeded those prom sed n the peace settlement

In 1921 the Greeks rashly advanced upon the Turks and were over whelming y route l Smyrna was burned and Greece filled w th *fugit ves* But th s fl ght wa as noth ng compare l to the nvas on of refugees that was to come By the terms of the Treaty of Lausanne (1923) the Greeks lost Eastern Thrace and all cla ms n As a M n or The Tu ks then ins sted that all Greek Christ ans n Turkey and all Mos lems n G eece (the except ons were few) must be returned to the r own countries even though they and the r fam l es *had been liv ng* abroad for centu ries This meant that 1 300 000 Greeks came home from Turkey several hundred thousand Armenians also fled to Greece in fear of the r persecutors and about 353 000 Moslems returned to Turkey Although this uproot ng of some two million people was accompanied by great suffer ing the new comers to Greece who were mostly skilled farmers, tobacco-raisers weavers and perfume-makers brought new life to the regions they settled

VISITORS ARE HAULED UP IN A BASKET



The famous Me eo a monas c es in Thessa y s and on the summ t s of so a ed p nna es This one can be ea hed by tmb ng up a se es of pe pend cu a ladde s Bu v s o s usually p e e o he pu ed up by ope and baske wo ked by a w nd ass on he p o e ng s u u e a the ght.

Most of them made their homes in western Thrace and in Greek Macedonia. Thus these regions, long fought over by the Balkan countries, became largely Greek in population.

The Short-Lived Hellenic Republic

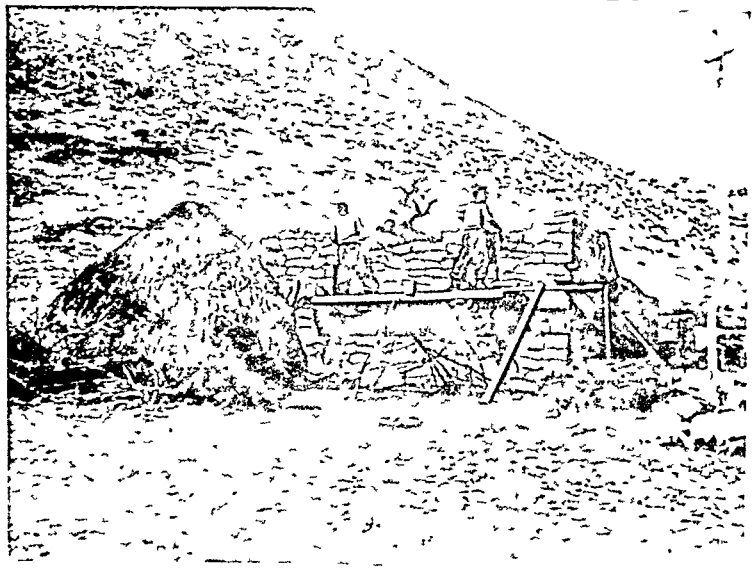
The disaster in Asia Minor dethroned Constantine a second time. He abdicated in 1922 and his son, George II, became king of the Hellenes The real power, however, lay with Gen. Theodore Pangalos. The army soon demanded that the new king also abdicate, and George left Greece in 1923. In 1924 the parliament proclaimed Greece the Hellenic Republic and declared the king deposed A plebiscite confirmed the action of parliament. Pangalos became premier in 1925, and in 1926 made himself dictator. For a brief period he regulated everything, down to the length of women's skirts. Then a revolution (1927) drove him out of power and into prison.

After a period of terror, peaceful elections took place. The republican Venizelos again guided Greek affairs from 1928 to 1932. He put the country's finances on a firm basis, encouraged industry, and signed a treaty of friendship with Turkey (1930). But bitter royalist opposition continued. In 1932 the royalist People's party, though a small minority, once more came into power. The republicans, fearing the government might recall the king, launched a revolution in 1935. The government put down the revolt, and George II returned to his throne. The next year (1936) the royalist leader Gen. John Metaxas became premier. He persuaded King George to dissolve parliament. From 1936 until his death in 1941 Metaxas ruled the country as a virtual dictator. He exiled Liberal and Communist leaders, suppressed trade unions, censored the press, and set up a youth movement patterned on that of Nazi Germany.

In April 1939, Mussolini invaded Albania, on Greece's northwest border. He assured Greece he would respect its integrity. Until this happened, Metaxas had been drawing close to the fascist nations, Germany and Italy. Now he quickly accepted British and French pledges of aid if needed. Greece remained neutral when the second World War broke out in September. On Oct 28, 1940, Italy without warning launched an attack on Greece from Albania. But the Greek army, though poorly equipped, drove the Italian forces back deep into Albania. Early in 1941 Great Britain sent troops and equipment to aid the Greeks and Germany had to intervene to save the Axis.

Hitler first conquered Yugoslavia in a lightning campaign Then he sent his panzer divisions racing down the Vardar Valley to Saloniki (April 8, 1941). On April 30 the Nazis occupied Athens On May 20 their air-borne infantry took Crete. The British and New Zealand forces were driven from Greece. King George II fled to Cairo with his cabinet. Later the Greek government in exile set up headquarters in London.

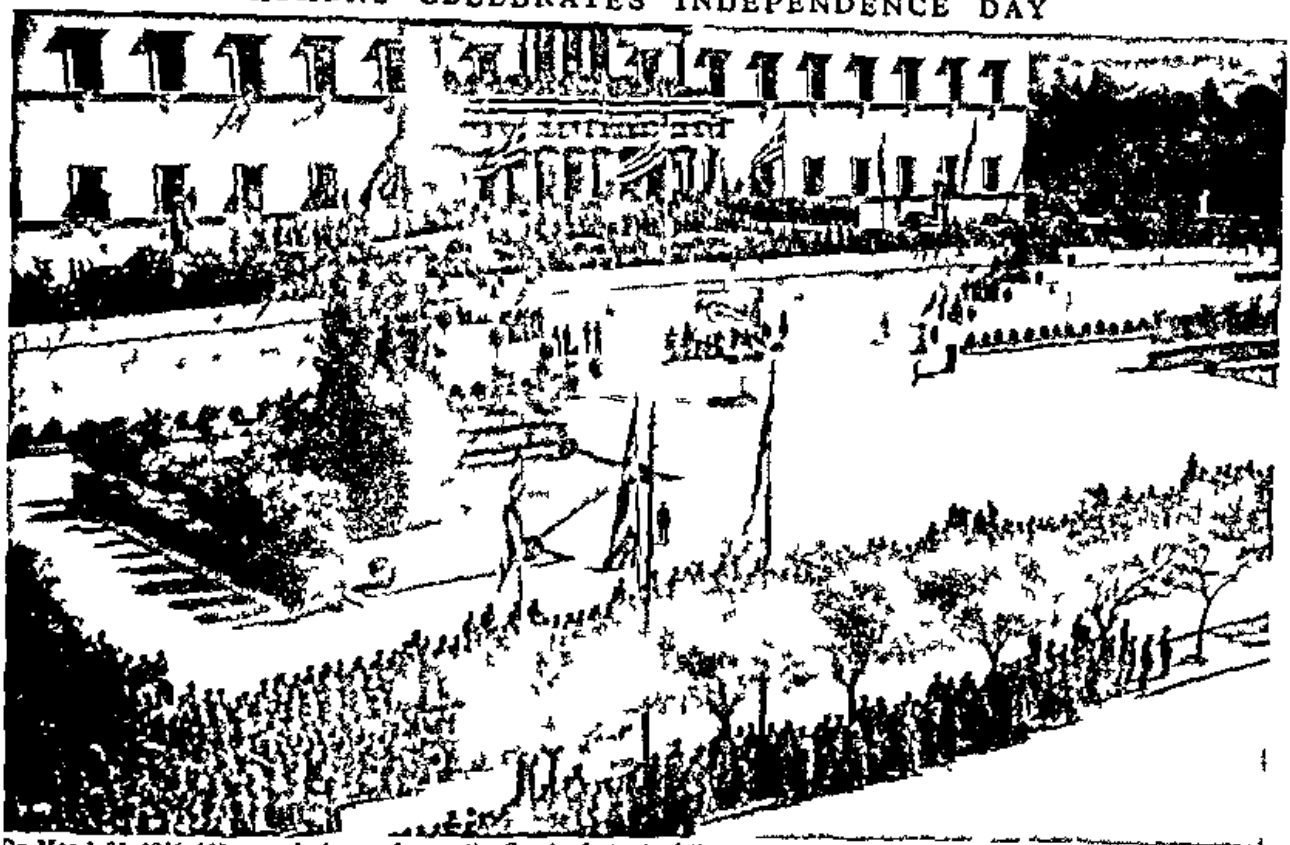
WAR DESTROYED THEIR HOMES





The second World War left 400 000 Greeks homeless. The upper picture shows farmers putting up a new stone house Meanwhile they sleep in the near-by grass hut. In the lower picture a mother and her children stand outside their rude lean-to. The mother has just baked a loaf of bread in an outdoor oven.

ATHENS CELEBRATES INDEPENDENCE DAY



On March 25 1946 125 years had passed s nce the Greeks first raised the flag of revo t against Turk sh rule He e crowds stand n the gardens of the o d palace to watch a parade n ce ebrat on of the day

The Germans vithdrew from Greece in the early fall of 1944 (*see* World War Second) In October the Greek government in exile (without the king) returned to Athens under Briti h protection

The government faced formidable p oblems In lustry was pract cally at a standst ll Railways and ridges had been wrecked and millions of homes destroyed Eighty per cent of the Greek mercantile marine had been lost A wild inflation made the currency pract cally worthless The people were half starved and impoverished Malaria and tuberculos s were rife Allied relief (UNRRA) brought in food cloth ing and med cines But reconstruction could make little headway for immediately after liberation Greece was plunged into c vil strife

Communists Try to Seize Athens

During the second World War Greek underground forces resisted the Nazis The Allies supplied them with arms At first they were unorganized Gradually Communists gained control of ELAS the army of the Greek Liberation Front (EAM) Democratic leaders commanded a small resistance group EDES

The Communi ts plotted to seize the government as soon as the enemy left In December 1944 ELAS made a bold move on Athens British troops opened fire and the *coup d état* failed Members of ELAS retreated to the mountains where they formed guerrilla bands They lived off the countryside looting villages and driving thousands from home Greek troops could not rout them from their rugged hideouts

Meanwhile Greece tried to establish a stable govern ment In 1946 the nat on held its first elect on in ten years The conservative Populist party won The minority Communist party refused to vote Arch bishop Damaskinos the king s regent retired in favor of George II who ascended the throne for the th rd t me On April 1 1947 George died He was succeeded by his brother Paul I

Peace Treaty Gains and Civil War

Though Greece had suffered greatly in the second World War, it gained little The Italian peace treaty of 1947 gave Rhodes and the other Dodecanese Islands to Greece The treaty also granted to Greece $105 000 000 as reparations from Italy

The Communist problem in Greece became an inter national issue In the summer of 1946 open civil war broke out between the guerrillas and government forces Greece charged that its Commun st-dominated Balkan neighbors gave refuge to Greek guerrillas and equipped them Greece appealed to the United Nations which sent a commission to investigate The majority of the commiss on supported Greek charges But Russia upheld its Balkan satellites and vetoed action by the United Nations (*see* United Nations)

The Communist plan seemed clear Soviet Russ a was continuing the imperialist aims of czarist Russia trying to extend the Russian sphere of influence south to the Mediterranean To prevent Greece from fall ng under Russian domination Great Britain had been giving financial and military aid to the Greeks

But early in 1947 Britain, hard pressed at home, announced it could no longer afford to give aid.

The "Truman Doctrine" Helps Greece

Greece appealed to the United States. On March 12, 1947, President Harry S. Truman asked Congress to help preserve the freedom of Greece. Truman declared it was necessary to the security of the United States to aid any nation whose independence was threatened by force of arms. Congress endorsed this "Truman Doctrine," and granted Greece a loan of $300,000,000 for military aid and reconstruction. The American Mission arrived in Athens in July.

The Communists had gained control of much of the wild mountainous country of northern and central Greece. Their swift raids and house burnings drove more than 400,000 homeless refugees into crowded cities. Greece was near collapse.

American officers trained the Greek army. Late in 1947 the Communist attack threatened to engulf the nation. The United States increased its economic aid and improved Greek defenses. The Communists surrendered in 1949. The European Recovery Program helped the Greeks to rebuild homes in the shattered north. At the United States demand Greece liberalized its government, and women voted for the first time in 1951. In 1952 Greece joined NATO. It joined Turkey and Yugoslavia in a defense pact in 1953. (For Reference-Outline and Bibliography, *see* Europe.)

The Stirring Days of Ancient Greece

WHY DOES the modern world still take an interest in ancient Greece? Why do we continue to study and discuss in great detail what happened 25 centuries ago on a rocky, half-barren peninsula in the Mediterranean no larger than the island of Cuba?

A visit to the Greece of today gives no answer. Neither does a mere review of the political and military events of ancient history. We concern ourselves with the Greece of old because Western civilization was born there. Because there, between 600 and 300 B.C., a handful of men dethroned the blind and arbitrary fates that had seemed to rule the world. They conceived instead the ideas that the universe is orderly and that by the use of their reason men can come to understand it. Accordingly they investigated and developed the principles of reasoning and applied them to every problem they could think of—from astronomy to politics and from mathematics to the fine arts.

In due course the knowledge gathered by the Greeks was passed on to the Romans, who applied it in developing the legal system and the engineering skill on which their great empire was founded. Then, as Christianity spread, its moral teachings found support in the orderly wisdom of the Greeks, and the two blended into a tradition and way of life under which western Europe became the center of progressive civilization.

The Beginnings of Greek Culture

The story of ancient Greece takes us back to about 1500 B.C., when wave after wave of barbarian invaders swept over and destroyed the towns and cities of the Aegean basin, and then gradually built up a new civilization upon the ruins. You may read elsewhere about the early Aegean civilization with its gold and bronze and pottery and paintings and its great palaces at Cnossus in Crete and at Mycenae and Tiryns on the mainland (*see* Aegean Civilization). The Greeks who swept down from the north and overwhelmed these cities were simple nomadic herdsmen—a branch of the Indo-European race that had for centuries been drifting to the east and west from their home in the grasslands east of the Caspian Sea (*see* Language and Literature). The first wave of invaders were the fair-haired Acheans of whom we read in Homer. The Dorians, who composed the second wave, came perhaps three or four centuries later, subjugating in their turn their Achean kinsmen. Other tribes, the Aeolians and the Ionians, found homes chiefly on the islands and coasts of Asia Minor.

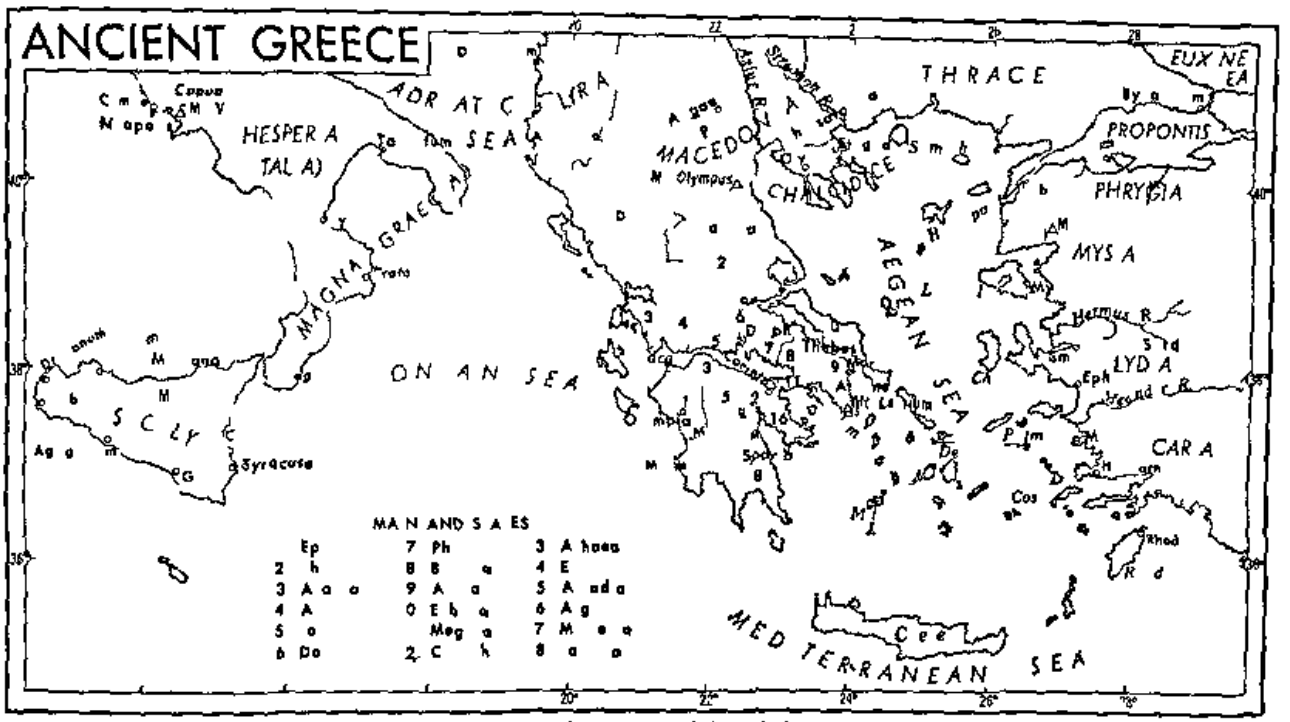
Life of the Early Wanderers

Something of the culture of the Aegean civilization these Greek—or, as the Greeks called themselves, Hellenic—invaders must have absorbed when they settled down and intermarried with the people they conquered. But, being still in the nomadic stage themselves, they were not fitted to come into the whole heritage of a city civilization. So of the earliest stages of the Greek settlement we know little, for these invaders were neither builders nor writers. But we may imagine them moving southward from their pasture lands along the Danube, driving their herds before them, bringing their families and primitive goods in rough oxcarts, stopping in one place just long enough to plant and harvest one crop. These families settled down in the pasture lands of the peninsula, gradually took up farming, and little by little formed communities ruled by kings and elders.

At this point we can begin to picture them. For the background of the 'Iliad' and the 'Odyssey' is the background of the Age of the Kings (*see* Homer). We see the Acheans living very simply, a race devoted to warfare. Their weapons and their songs are the only splendid things they have, except for the gorgeous robes and the beautiful jewelry and metal work they bought from Phoenician traders (*see* Phoenicians). The palace of Odysseus is built of wood, a hall about a court. In this hall they cook and eat. Sometimes it gets very smoky, for there are no chimneys. And the bed of Odysseus is no work of the cabinet-maker's art, but a very rude affair wrought by Odysseus himself out of a living olive tree.

The City-States and Their Far-Flung Colonies

In the 'Iliad' we see Greeks from many cities—Sparta, Athens, Thebes, Argos, and the rest—all more or less united to fight their common foe Troy in Asia Minor (*see* Trojan War). In historic times the Greeks were again able to work more or less together



This map shows the chief states and divisions of ancient Greece which included settlements in Asia Minor Sicily and southern Italy The map of modern Greece at the right shows the physical features of the country and its principal

when the power of Persia threatened them all But Greece never became a nation The only patriotism the Greek ever knew was loyalty to his city This seems particularly strange to us nowadays because the cities were so small Except Athens probably no Greek city state counted more than 20 000 citizens

Just as Europe today is chopped up into nations instead of being a few large political units as North America is so on a smaller scale ancient Greece was divided by its mountain ranges And even the plains thus enclosed were in many cases subdivided containing several city states and surrounding its acropolis or citadel These flat topped naturally defensible rocks or mounds are characteristic of Greece and were first used as places of refuge From the Corinthian isthmus rose the lofty Acrocorinthus from Attica the Acropolis of Athens from the plain of Argolis the mound of Tiryns and loftier still the Larissa of Argos On these rocks they built their temples and their kings palace and their houses clustered about the base

Only in a few cases did the city-state push its holdings beyond very narrow limits Athens held the whole plain of Attica and most of the Attic villagers were Athenian citizens Argos conquered the plain of Argolis Sparta made a conquest of Laconia *and part of the fertile plain of Messenia the conquered people being subjects* not citizens Thebes *attempted to be the ruling city of Boeotia but never quite succeeded (see Thebes)*

Similar city-states were found through all the Greek world, which had early flung its outposts throughout the Aegean basin and even beyond There were Greeks in all the islands of the Aegean in Thasos famous for its gold mines in Samothrace Imbros and Lemnos long occupied by Athenian colonists in Lesbos where burning Sappho loved and sung and Scyros island of Achilles in Chios Samos and Rhodes as well as in the nearer-lying Cyclades — so called (from the Greek word for circle) because they formed a circle around the sacred island of Delos—and to the southern the island of Crete The western shores of Asia Minor were fringed with Greek colonies reaching out past the Propontis (Sea of Marmara) and the Bosporus to the northern and southern shores of the Euxine or Black Sea In Africa there were among others the colony of Cyrene and the trading post of Naucratis in Egypt Sicily too was colonized by the Greeks and there and in southern Italy so many colonies were planted that this region came to be known as Magna Graecia or Great Greece Pressing farther still the Greeks founded the city of Massilia now Marseilles in Gaul

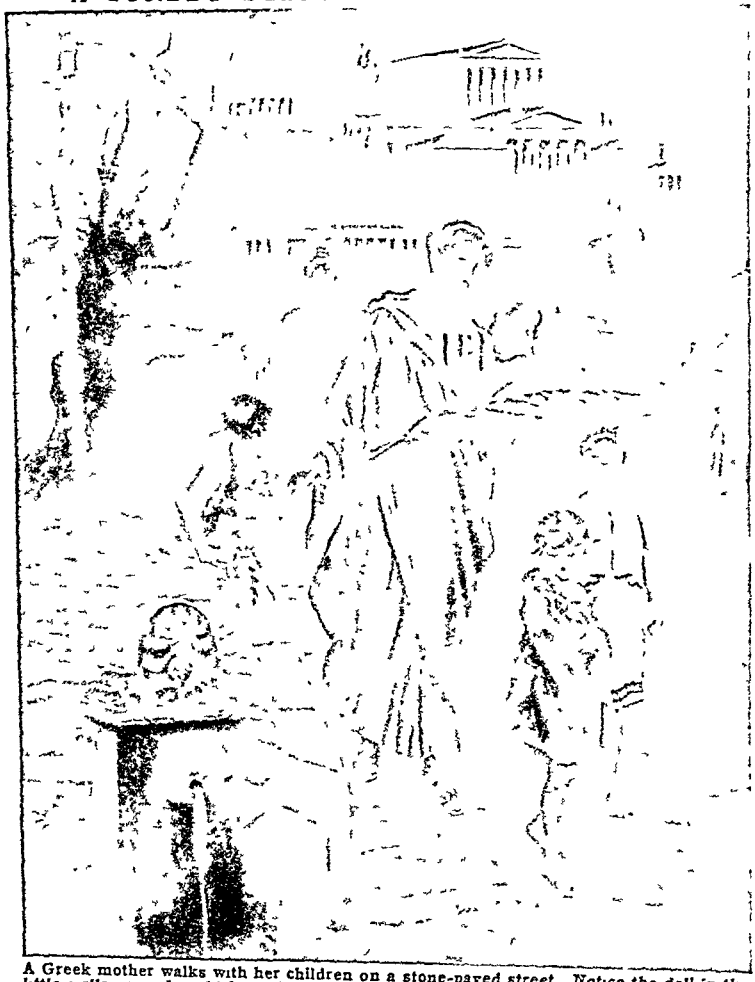
The Lack of Political Unity

Separated by barriers of sea and mountain by local pride and jealousy the various independent city states never even conceived the idea of forming a political unit of the Greek-speaking world except as some powerful state embarked on a career of conquest and attempted to make itself mistress of the rest Many influences made for unity — a common language a common religion a common literature similar customs the religious leagues and festivals the Olympic Games — but even in time of foreign invasion it was with the greatest difficulty that the cities were induced to act together

Various Types of Government

The government of many of the city-states — notably Athens — passes through four stages as we

A STREET SCENE IN ANCIENT ATHENS



A Greek mother walks with her children on a stone-paved street. Notice the doll in the little girl's arms, bought from the peddler sitting on the curb. Observe also the drinking fountain at the left. In the background rises the hill known as the Acropolis, crowned by the Parthenon and other temples. The painting is by a French artist, André Castaigne.

watch it from Homer to historical times. During the 8th and 7th centuries B.C. the kings disappear, monarchy gives way to oligarchy, that is, the rule of the few. The power goes over to the wealthy land-owning nobles—the "Eupatrids" or well-born. But the rivalry among the nobles and the discontent of the oppressed masses are too great, and soon a third stage appears.

This third type of government is known as tyranny. Some Eupatrid suddenly seizes absolute power—usually by obtaining the favor of the people and promising to right the wrongs inflicted upon them by the other land-holding Eupatrids. He is known as a "tyrant," which among the Greeks was not a term of reproach, merely implying one who had seized kingly power without the qualification of royal descent. The tyrants of the 7th century were a steppingstone to democracy, or the rule of the people, which was nearly everywhere established in the 6th and 5th centuries. For it was the tyrant who taught the people their rights and their power.

By the beginning of the 5th century B.C. Athens had gone through these stages and emerged as a democracy—the first democracy in the history of the world. Between two and three centuries before this the kings had made way for officials called "archons," elected by the nobles, and the aristocratic form of government was established. About 621 B.C. an important step in the direction of democracy was taken, when the first written laws in Greece were compiled from the existing traditional laws. This reform was forced by the peasants to relieve them from the oppression of the nobles. But this code—which was so severe that the adjective "Draconic," from the name of its compiler Draco, is still a synonym for "harsh"—did not give sufficient relief. A revolution was averted only by the wise reforms of Solon, about a generation later (*see* Solon). But Solon's reforms only put off the fatal day, and in 561 B.C. Pisistratus, aided by the discontented, made himself tyrant. With two interruptions, Pisistratus ruled for more than 30 years, fostering commerce, agriculture, and the arts, and laying the foundation for much of Athens' future greatness. His sons Hippias and Hipparchus attempted to continue their father's power, but one of them was slain by two youths, Harmodius and Aristogiton, who henceforth lived in Greek tradition as themes for sculptors and poets. By the reforms of Clisthenes, about 509 B.C., the rule of the people was firmly established.

Very different was the course of events in Sparta (*see* Sparta), which had now established itself as the most powerful military state in Greece. Under the strict laws of Lycurgus (*see* Lycurgus) it had maintained its primitive monarchical form of government with little change. Nearly the whole of the Peloponnesus had been brought under its iron heel, and it was now jealously eyeing the rising power of its democratic rival in central Greece.

During this period the intellectual and artistic culture of the Greeks centered among the Ionians of Asia Minor. Thales, called "the first Greek philosopher," was a citizen of Miletus. He became famous for predicting an eclipse of the sun in 585 B.C.

Suddenly there loomed in the east a thundercloud which threatened to sweep away the whole promising structure of the new European civilization Persia the great Asiatic world-empire of the day had suddenly been awakened to the existence of the free peoples of Greece by the aid which the Athenians had sent to their oppressed kinsmen in Asia Minor The dramatic story of how the scanty forces of the Greeks drove back the enormous Persian armaments is told in the article on the Persian Wars

How Athens Rose to Power

From this momentous conflict Athens emerged a blackened ruin but yet the richest and most powerful state in Greece She owed this position chiefly to the shrewd policies of her statesman Themistocles who had seen that naval strength not land strength was henceforth to be the key to power Whoso can hold the sea has command of the situation he said He persuaded his fellow Athenians to build a strong fleet—larger than the combined fleets of all the rest of Greece—and to fortify the harbor at Piraeus This fleet became the instrument by which the Persians were finally defeated at the battle of Salamis and also by which Athens made herself mistress of the Aegean For within three years after Salamis (480 B C) Athens had united the Greek cities of the Asiatic coast and of Aegean islands into a confederacy (called the Delian League because the treasury was at first on the island of Delos) for defense against Persia and in another generation this confederacy had become an Athenian Empire

Almost at a stride Athens was transformed from a provincial city to an imperial capital Wealth beyond the dreams of any other Greek state flowed into her coffers—tribute from subject and allied states customs duties on the flood of commerce that poured through the Piraeus and revenues from the Attic silver mines The population increased fourfold or more as foreigners streamed in to share in the prosperity The learning that had been the creation of a few wise men throughout the Grecian world now became fashionable The arts flourished as never before in history Painters and sculptors vied in beautifying Athens with the works of their genius—treasures which even today battered and defaced by time and man still remain among the wonder works of human skill This period which stands out as one of the most remarkable and brilliant in the world s history, reached its culmination in the age of Pericles 460–430 B C (*see* Pericles) Under the stimulus of wealth and power with abundant leisure and free institutions the citizen body of Athens attained a higher average of intellectual interests than any other society before or since

But we must remember that a very large part of the Athenian population were not citizens for the Athenian state rested on a foundation of slavery Two fifths (some authorities say four fifths) of the population were slaves Slave labor produced a large part of the wealth that gave the citizen the time and money to pursue art and learning and serve the state

Slavery in Greece was a peculiar institution When a city was conquered its inhabitants were often sold as slaves Kidnaping boys and men in barbarian that is non Greek lands and even in other Greek states was another steady source of supply If a slave was well educated or could be trained to a craft he was easily disposed of And a slave always had a chance of obtaining his freedom for quite frequently his master would let him work for hire and this gave him a chance to save money After he had bought his freedom or had been set free by a grateful master he became simply a metic —a resident alien Many of the slaves however had a miserable lot They were sent in gangs to the silver mines at Laurium where they worked underground by the dim light of little olive-oil lamps in narrow corridors

DEMOCRACY AT WORK IN 500 B C



When leaders disagreed the voter wrote on a shell or pottery fragment (*ostrakon*) the name of the one he wanted banished or ostracized Here an illiterate peasant not recognizing Aristides gets the great man to write his own name on the shell He had nothing against him he said *he was simply* tired of hearing him called the Just (*see* Aristides)

Daily Life in the Periclean Age

Though the citizens of Athens were thus set free from much of the drudgery of life, we must not get

the idea that they reveled in luxury. "Plain living and high thinking" might have been their motto, for the standard of comfort was very low in comparison with our own. The houses were of sun-dried brick, built two stories high along narrow winding streets, into which refuse was thrown instead of being properly drained or carted off. The people ate two meals a day, each consisting of bread, perhaps a broth of beans and pulse, with wine and sometimes fruit to wash it down. Fish with the bread was thought to make a remarkably fine meal. Olives and olive oil were largely used; honey took the place of sugar, and cheese was often eaten in place of meat, but butter was practically unknown. Athens can be nearly as cold in winter as Philadelphia, yet the only heat in the houses was a brazier or dish of burning charcoal. There was no plumbing, nor were there chimneys, and the smoke from the stove in the tiny kitchen sometimes preferred wandering around the house to going out the hole in the roof provided for it. There were no windows on the first floor, but in the center of the house was a broad open court—as you will find in Spain or in the Oriental countries today—with the men's apartment, the women's apartment, and the tiny cupboard-like bedrooms clustered about it. The second story sometimes had a window or two looking down upon the street.

But the real life of the city was out of doors. The men spent much of their time talking politics and philosophy in the agora or market place, exercising or lounging in the athletic fields, performing military duty, sitting in the Assembly or the Council of 500, taking part in the numerous state festivals, or doing jury duty—there were 6,000 jurors on duty all the time in Athens, for all the allied cities were forced to bring their cases to Athens for trial. Daily salaries were paid for jury service and service on the Council, which made up a considerable part of the income of the poorer citizens. The women stayed at home, attending to the affairs of the house and spinning and weaving the wool for clothing. They never acted as hostesses when their husbands had parties, and were only seen in public at the theater—where they might attend tragedy but not comedy—and at certain religious festivals.

The Peloponnesian War (431-404 B. C.)

Such was life in Athens in the heyday of her glory, before the jealousy of Sparta and other independent Greek states and the discontent of the subject states of the Athenian Empire flamed up into a war that broke the power of Athens. The long struggle, called the Peloponnesian War, broke out in 431 B C. It was a contest between a great sea power, the Athenian Empire, and a great land power, Sparta and the Peloponnesian League.

The plan of Pericles at the beginning of the war was not to fight at all, but to let Corinth and Sparta spend their money and energies while Athens conserved both. Therefore he had all the inhabitants of Attica come inside the walls of Athens and let the Peloponnesians enter the plain of Attica year after year and ravage as they would, while Athens, again without losses, harried their lands by sea. But Pericles reckoned without the dangers of overcrowding. The plague broke out in Athens and killed one fourth of the population, including Pericles himself, and left the other three fourths without spirit and without a leader. The first phase of the war ended with the supremacy still undecided.

Alcibiades and His Evil Influence

Almost before they knew it, however, the Athenians were whirled by the unscrupulous demagogue Alci-

CLINGING CLOTH CARVED FROM THE SOLID STONE



These three figures from the ruins of the Parthenon in Athens, and now in the British Museum, are generally supposed to present the finest treatment of drapery known to the sculptor's art. Mutilated as they are, the exact meaning of these figures remains a mystery. They are commonly called 'The Three Fates', but another interesting theory is that the reclining form is that of Thalassa "the Sea," lying in the lap of Gaia "the Earth," and that the exquisite flowing lines of drapery represent the waves breaking upon the shore. According to this theory, the figure at the left did not belong to the group.

RELICS FROM HOMES OF THE ANCIENT GREEKS



The toy horse on wheels is made of terra cotta The jars on its back are like those carried by real horses for taking provisions to and from market The pretty jug with a spout is a feeding bottle The bronze lamp has a handle for carrying A wick burned in the spout and oil was poured in from the top (*Courtesy of the Metropolitan Museum of Art*)

biades nephew of Pericles into the second phase (414–404 B C) Wishing for a brilliant military career Alcibiades persuaded Athens into a stupendous expedition against Syracuse a Corinthian colony in Sicily The armada was destroyed in 413 B C , and the captives were sold into slavery

This disaster sealed the fate of Athens Those allied cities about the Aegean that had remained faithful now deserted to Sparta and the Spartan armies laid Athens under siege In 405 B C the whole remaining Athenian fleet of 180 triremes was captured in the Hellespont at the battle of Aegospotami Besieged by land and powerless by sea, Athens could neither raise grain nor import it, and in 404 B C the Athenian Empire came to an end The fortifications and long walls connecting Athens with Piraeus were destroyed, and Athens became a vassal of triumphant Sparta

The End of the Greek City States

Sparta tried to maintain its supremacy by keeping garrisons in many of the Greek cities This custom together with Sparta s hatred of democracy made its domination unpopular At the battle of Leuctra in 371 B C the Thebans under their gifted commander Epaminondas broke the power of Sparta Theban leadership was, however, short-lived, for it depended on the skill of Epaminondas When he was killed in the battle of Mantinea in 362 B C *Thebes really suffered defeat in spite of its victory* The age of the powerful city states was at an end, and a prostrated Greece invited a conqueror

Such a conqueror was found in the young and strong country of Macedon lying *just to the north* of classical Greece Its King Philip, who came into power in 360 B C , had had a Greek *education and*, seeing the weakness of the disunited cities made up his mind to possess the Greek world *Demosthenes* (*see* Demosthenes) saw the danger that threatened and by a series of fiery speeches against *Philip sought* to unite the Greeks as they had once been united against Persia But Philip was too strong for *them* and at the battle of Chaeronea (338 B C) established his leadership Before he could carry his *conquests to* Asia Minor, however, he was killed and his power fell to his son Alexander, then not quite 20 years old How Alexander firmly established himself throughout Greece, and then overthrew the vast power of Persia, building up an empire that embraced nearly the entire known world, is told in a separate article (*see* Alexander the Great)

The Hellenistic Age and Roman Conquest

The three centuries that follow the death of Alexander are known as the Hellenistic age, for their products were no longer pure Greek but Greek plus the characteristics of the conquered nations It was a time of great wealth and splendor Art, science and letters flourished and developed The private citizen no longer lived crudely, but in a beautiful and comfortable house, and many cities adorned themselves with beautiful public buildings and sculptures

This age came to its end in another conquest—that of Rome On the field of Cynoscephalae ("dogs' heads), in Thessaly, the Romans defeated Macedonia in 197 B C and gave the Greek cities their freedom as allies Even so the Greeks caused Rome a great deal of trouble, and were taught their lesson by the burning of Corinth in 146 B C and their reduction to vassalage Athens alone was revered and allowed a certain amount of freedom, and to its schools went many Romans Cicero among them

When the seat of the Roman Empire was transferred to the east, Constantinople became the center of culture and learning and Athens sank rapidly to the position of an unimportant country town (*see* Byzantine Empire) In the fourth century of the Christian Era Greece was devastated by the Visigoths under Alaric, in the 6th century it was overrun by the Slavs, and in the 10th century it was raided by the Bulgars In 1453 the Turks seized Constantinople and within a few years practically all Greece was in their hands How the Greeks finally regained their independence in the 19th century is told in the earlier section on modern Greece

The Heritage Left by the Ancient Greeks

The glorious culture of the Greeks had its beginnings before the rise of the city states to wealth and power, and survived after the Greeks had lost

their independence. The men of genius who gave their stamp to the age seemed to live a life apart from the tumultuous politics and wars of the period. They sprang up everywhere, in scattered colonies as well as in the peninsula. And when the great creative age had passed its peak, Greek artists and philosophers were sought after as teachers in other lands, where they spread the wisdom of their masters.

What were these new ideas for which the world reached out so eagerly? First among them was the determination to live by the light of reason, to follow the truth wherever it led. In their sculpture and architecture, in their literature and philosophy, the Greeks were above all else reasonable. "Nothing to excess" (*meden agan*) was their guiding principle, which the Roman poet Horace later interpreted as the "golden mean."

Their art was singularly free from exaggeration. Virtue was for them a path between two extremes—only by temperance, they held, could man attain happiness. Believing in a balanced life of the mind and body, they had time too for play, and played magnificently (*see* Olympic Games). Even in the most troubled times they kept their joy in life, refusing to surrender to pessimism.

HOW THE GREEKS DECORATED POTTERY



This exquisite decoration of an ancient Greek vase was pieced together from broken fragments. In this type of work the background was painted black and the figures delicately sketched in with black lines over the natural red of the clay.

From Homer to Aristotle

This many-sided culture seemed to spring almost full-grown into being. Babylon contributed a little astronomy and Egypt the rudiments of geometry and medicine; but the genius of the Greeks owed little to these ancient civilizations. As we have seen, their culture had its beginnings in the settlements on the coast of Asia Minor. Here Homer sang of a joyous, conquering people and of their gods who, far from being aloof and forbidding, were always ready to come down from Mount Olympus to play a part in the absorbing life of mankind (*see* Homer; Mythology; Trojan War). In Asia Minor too philosophy was born. Here in the 6th century B.C. Thales, Heraclitus, Democritus, and other nature-philosophers speculated on what stuff the world is made of. Thales also contributed to the science of geometry, which was further advanced by Pythagoras in a distant colony in southern Italy (*see* Pythagoras).

In the 5th century B.C. with the rise of Athens as a wealthy democratic state, the center of Greek culture passed to the peninsula. Here the Greeks reached the peak of their extraordinary creative energy. This was the great period of Greek literature, architecture, and sculpture, culminating in the "Golden Age" of Pericles (*see* Pericles; Architecture; Greek Art; Greek Literature). Philosophers now turned their thoughts from the study of matter to the study of man himself (*see* Education). Toward the end of the century Socrates ushered in the most brilliant period of Greek philosophy, passing on his wisdom to his pupil Plato, who in turn handed it on to "the master of those who know," the great Aristotle (*see* Socrates; Plato; Aristotle; Academy).

Progress of Science in the Hellenistic Age

Alexander spread Greek learning with his conquests. The three centuries following his death (323 B.C.) are called the Hellenistic Age, as distinguished from the true Hellenic period. The city founded by Alexander at the mouth of the Nile—called after him Alexandria—now became the intellectual capital of the world (*see* Alexandria).

In literature and art the Hellenistic Age was imitative, looking to the masterpieces of earlier days for inspiration; but much brilliant work was done in science. Archimedes in Sicily put mechanics on a sound footing and Euclid established geometry as a science (*see* Archimedes; Geometry). Eratosthenes made maps and calculated the earth's circumference (*see* Earth). Aristarchus put forward the hypothesis that the earth revolves around the sun. But Ptolemy clung to the belief in a central earth with heavenly bodies circling around it; and his works remained standard throughout the Middle Ages (*see* Ptolemy).

How Greek Culture Survived

The Hellenistic Age came to an end with the establishment of the Roman Empire in 31 B.C. The Romans borrowed from the Greeks their art and science as well as their philosophy of stoicism. When Christianity grew and spread it was inevitably influenced by Greek thought. Through the period of the barbarian invasions Greek learning was preserved by the Christians in Constantinople and by the Mohammedans in Cairo (*see* Mohammed). Later its light shone again in the Middle Ages with the founding of the great universities in Italy, France, and England. During the Renaissance it provided an impetus for the rebirth of art and literature (*see* Renaissance). Modern science itself rests on the Greek idea of man's capacity to solve his problems by rational methods. In almost every phase of life today the quickening impulse of Greek thought can still be seen among the peoples who inherited this priceless legacy. (For Reference-Outline and Bibliography, *see* Ancient History.)

The GLORIOUS ART *of* GREECE *and How* ROME *Helped Transmit It to Us*



THE poet tells us that "A thing of beauty is a joy forever More than 20 centuries ago the ancient Greeks inspired by lofty ideals of Beauty Truth, and Goodness which in their simple and harmonious view of life were inseparable created works of art which have never been equaled Worn and defaced by time, these art works are still so beautiful that to look upon them is an inspiration Many men have spent the best part of their lives searching for these beautiful fragments and thus helping to piece out the story of Greek art Something of this wonderful story — the conditions under which Greek art was born, its development and the great masters and their work — is told in this article It tells, too, how when Greece fell her beauty held captive the practical-minded Roman conquerors, how, under her influence, the Romans developed an art of their own, and also helped to transmit to later ages the unsurpassed glory of the art of the Greeks

GREEK AND ROMAN ART Greek art owes a great deal to natural conditions Greece is one of the fairest lands in all the world nowhere else has Nature brought together the charm of mountains and sea and sky in more beautiful combination The firm lines of mountains and crags outlined in the crystal clear air against the brilliant blue of the sky must have helped to inspire that love of simple graceful line, of perfect proportion and symmetry of strength and serenity, which is characteristic of Greek architecture and sculpture Responding to the beauty that was everywhere about him, the Greek aspired to make his mind and his body harmonious and beautiful as Nature It is impossible to measure how much the sculptor owed to the Greek emphasis of physical culture and athletics And Nature endowed the Greeks in another important way, for many of the islands off the coast, notably Paros, are almost solid blocks of white marble, while in Attica the quarries of Mount Pentelicus and Mount Hymettus also yield an abundance of the beautiful white stone which invites the sculptor s chisel

But we must not think that cold white marble alone satisfied the Greeks They used color in both their sculpture and their architecture, though time has almost entirely washed away the reds and blues and other bright hues with which they touched up their work, and we can only imagine what the effect must have been when those works were in their prime The work of the great Greek painters also has disappeared, and lives only in what the ancient writers tell us about it and in the work of their disciples of a later day Polygnotus in the 5th century, we are told was renowned as a draftsman while the great painters of the 4th century—Parrhasius, Zeuxis, and Apelles—were famous as colorists

Fortunately many Greek vases have been preserved in tombs and in other sites uncovered by modern excavators Simple and graceful in form, these vases show in the earliest specimens geometric designs, then figures of men and gods, painted in black against the natural red of the clay or as later became more common with the figures left red against a black background From these vases we are able to form some idea of what Greek painting was like and they give us further examples of that wonderful feeling for form and line which made the Greeks supreme in the field of sculpture

We must not imagine that Greek art sprang fullblown into being The ancestors of those artists who were to create the most perfect forms of sculpture that the world has ever seen were a semi barbarous people, when they began to migrate into the peninsula that is now Greece, and centuries rolled by before their genius flowered into the art forms which have been the admiration of all later times Though they must unconsciously have been influenced by the art of the Aegean peoples whom they overwhelmed no relation can be traced between the well wrought figures and reliefs of Tiryns and Mycenae and Cnossus, and the crude beginnings of Hellenic sculpture in the 7th century B C When we see how primitive and stiff are the Greek statues of that archaic period, and compare them with the masterpieces of two centuries later, we cannot but marvel at the rapid development of Greek art, when once it got fairly under way Through the Phoenicians the great trafficking race of the age the early Greeks came in contact with the art of Babylonia, Assyria, and Egypt They borrowed many of their decorative forms from these peoples, but transformed them by the fires of their own superb powers

Greek religion, Greek love of beauty, and a growing spirit of nationality were finding fuller and fuller expression But it took a storm like the Persian invasion (490–479 B C) to arouse the young virile race to great achievements Having driven out the Asiatic invader, the Greeks suddenly grew, in the 5th century, to full stature What the Persians had destroyed the Greeks set to work to rebuild Their poets sang the glories of the new epoch, and Greek genius, as shown in the great creations at Athens,

came to full strength and beauty. It was then, under Pericles, that the Athenian Acropolis was restored and adorned with the matchless Parthenon, the Erechtheum, and other beautiful buildings. (*See* Acropolis; Athens.) There were beautiful temples in other cities of Greece too, notably that of Zeus at Olympia, which we know from descriptions by the ancient writers and from a few fragments that have been discovered in recent times. (For Greek architecture *see* Architecture.)

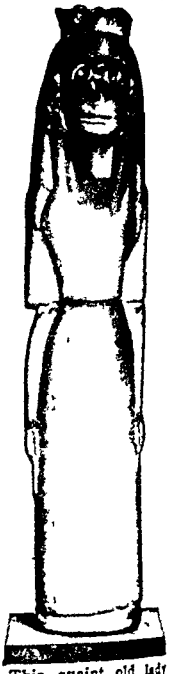
The 5th century was made illustrious in sculpture also by the work of three great masters, all known to us in some degree by surviving works. Myron is famous for the boldness with which he fixed moments of violent action in bronze, as in his famous 'Discobolus', or Discus Thrower, which we know through a fine copy now in Munich. The 'Doryphorus', or Spear Bearer, of Polyclitus, who also worked in bronze, was called by the ancients the Rule, or guide in composition, because it was believed to follow the true proportions of the human body more perfectly than any other work.

THE GOD OF WAR AT REST



Compare this wonderful statue of the god Ares (Mars) with the crude figure at the right, and you will appreciate what progress the Greeks made in art in the course of a few centuries. This statue, the famous 'Villa Ludovisi Mars', is believed to be a copy of an original by Scopas or Lysippus. It is an excellent example of the characteristic "restraint" of Greek art. To show the violent character of the God of War, the sculptor merely extended the breadth of his nostrils, as men dilate them in anger. Playing at his feet is the little God of Love.

AN ANCESTOR OF THE VENUS DE MILO



This quaint old lady is an example of very early Greek sculpture. From such crude beginnings developed the art which created the Venus de Milo.

But the greatest name in Greek sculpture is that of Phidias (*see* Phidias). It was under his direction that the sculptures decorating the Parthenon were planned and executed, and some of them may have been the work of his own hand. His great masterpieces, the colossal gold and ivory statue of Athena, which stood within this temple, and the similar one of Zeus in the temple at Olympia, have disappeared. But we can form some conception of his great genius from the remains of the sculptures of the pediments and frieze of the Parthenon, now preserved in the British Museum and known as the Elgin Marbles, from Lord Elgin who brought them from Athens in 1801-12. These sculptures are the greatest works of Greek art that have come down to us. Another famous work that is believed to belong to the school of Phidias is the 'Aphrodite' of Melos, commonly known as the Venus de Milo, a marble statue now in the Louvre in Paris. Although some think it belongs to a later date, its perfect proportions, its calm dignity, and noble serenity typify the qualities which we associate with Phidias.

The works of Phidias were followed by those of Praxiteles, Scopas, and Lysippus. Of Praxiteles, "the sculptor of the beautiful," we have what is believed to be an original work, the statue of 'Hermes with the Infant Dyo-

AN EXAMPLE OF ART IN THE ROMAN HOME



A scene f om Roman life as dep ed n a wall pa n ng Many su h pa n ngs we e d sco e ed n he ruins o Pompeii and He cu laneum Fo 1 en uries the easu es of these c es ay buried beneа h he ashes of Vesu us A ast unco e ed hey affo d ex e lent and varied examp es of G e o Roman art The G eek nfluen e n fo m and compos tion a refle ed n the mu al paintings of Roman v llas Bu h he de ails hey a e mu h mo e ealistic than was the class c art of G eece

nysus This s the only statue that can be dent fied with one of the great G eek masters Most of those sculptors it must be remembered are known to us only through cop es of the r work by Roman artists The figure of Hermes at once strong and act ve and graceful beautifully proport oned w th a surface of exquisite texture the well poised head and the face expressive of nobility and sweetness is beaut ful beyond descr ption The child which is held in the left hand is reaching out to grasp something perhaps a bunch of grapes—held in the missing hand of Hermes The so-called Satyr or Faun of Praxiteles which suggested Hawthorne s Marble Faun is probably the work of another sculptor of

FIGURES FROM THE WEST FRIEZE OF THE PARTHENON



Greek Art reached its climax in the Parthenon Here we see three of the figures in the frieze on the west front, where the great "Panathenaic Procession" is represented as starting Here the young soldiers are mounting or preparing to mount, one of them stooping to fasten his sandal. Notice the spirited action of these classic steeds of stone. The Greeks did not think it appropriate for horses to walk quietly in a procession. To do justice to the occasion they felt horses should prance and rear.

the same school. Praxiteles' conceptions are less lofty and dignified than those of Phidias, but they are full of grace and charm. Scopas carried further the tendency to portray dramatic moods, giving his subjects an intense impassioned expression. Lysippus returned to the athletic type of Polyclitus, but made his figures lighter and more slender, combining manly beauty and strength. He was at the height of his fame in the time of Alexander the Great, who, it is said, desired that Lysippus only should portray him. How far this age had advanced in the expression of graceful motion through the modeling of the figure and the skilful handling of the drapery can be seen in the celebrated 'Winged Victory' of Samothrace, now in the Louvre.



THE YOUNG AUGUSTUS
A fine example of Roman portrait sculpture

As time went on, Greek art lost much of its simplicity and ideal perfection of form, its serenity and restraint, but it gained in intensity of feeling, in expressing physical suffering and anguish. It had also become more realistic, portraying not only ideal types of men and gods but portraits of individuals, and not only Greeks but barbarians as well. One of the most famous works of the period after the death of Alexander is the 'Dying Gaul' sometimes called the 'Dying Gladiator'. In the 'Laocoön' group, which depicts the father and his sons crushed to death by deadly serpents, we find the extremity of physical torture as represented in sculpture. To this period belongs also the famous 'Apollo Belvedere', a statue of very great beauty, though it has lost something of the vigor and the calm power of the more heroic days. (For picture, *see* Apollo.)

The Art of the Romans

From early times the Romans had felt the artistic influence of Greece, and when in 146 B.C. Greece was finally conquered by Rome, Greek art became inseparably interwoven with that of Rome. "Greece, conquered, led her conqueror captive"—this is the poet's way of expressing the triumph of Greek over Roman culture. But it is a mistake to suppose that the Romans were merely imitators, or that Roman art was merely a decayed form into which Greek art had fallen

To a large extent the art of the Romans was a development of that of their predecessors in Italy, the Etruscans, who, to be sure, had learned much from the Greeks (*see* Etruscans). Nor were the Romans themselves entirely without originality Though their artistic forms were, for the most part, borrowed, they expressed in them, especially in their architecture, their own practical dominating spirit, as you may read in the article on Architecture

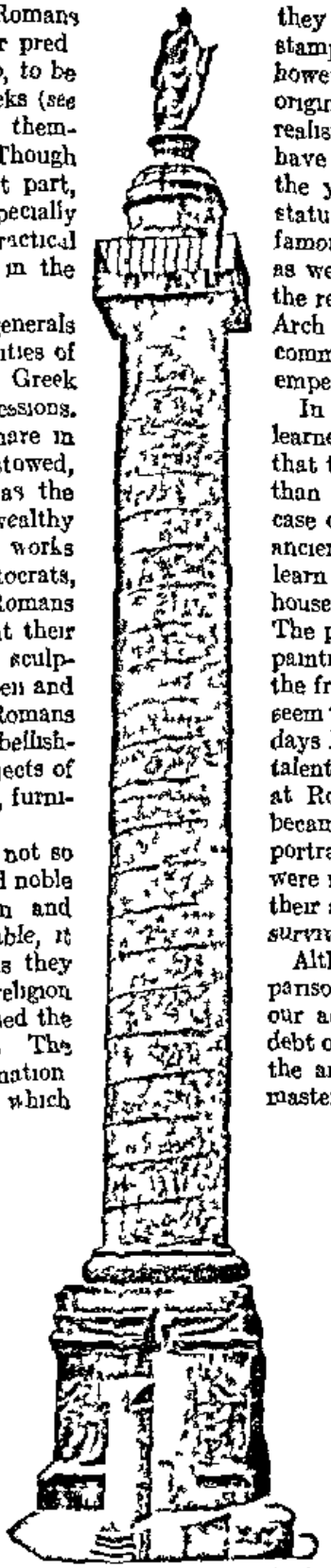
In the 2d century B C the Roman generals began a systematic plunder of the cities of Greece, bringing back thousands of Greek statues to grace their triumphal processions. Greek artists flocked to Rome to share in the patronage that was so lavishly bestowed, owing to the rich conquests made as the Roman power was extended The wealthy Romans built villas, filled them with works of art in the manner of our modern plutocrats, and called for Greek artists or Romans inspired by Greek traditions to paint their walls and decorate their courts with sculptures The ruins excavated at Pompeii and Herculaneum show us how fond the Romans and their neighbors in Italy were of embellishing not only their houses, but the objects of daily use, such as household utensils, furniture, etc (*see* Pompeii)

But with the Romans art was used not so much for the expression of great and noble ideas and emotions as for decoration and ostentation As art became fashionable, it lost much of its spiritual quality As they borrowed many elements of their religion from the Greeks, so the Romans copied the statues of Greek gods and goddesses The Romans were lacking in great imagination Even in one of the few ideal types which they originated, the 'Antinoüs', the Greek stamp is unmistakable In one respect, however, the Roman sculptors did show originality, they produced many vigorous realistic portrait statues Among those that have come down to us are a beautiful bust of the young Augustus, a splendid full length statue of the same emperor, and busts of other famous statesmen All these have a historic as well as an artistic value So, too, have the reliefs which adorn such structures as the Arch of Titus and the Column of Trajan, commemorating great events in these emperors' reigns

In painting—though here too, they learned from the Greeks—it seems probable that the Romans developed more originality than in sculpture Unfortunately, as in the case of the Greeks, the great masterpieces of ancient painting no longer exist, but we can learn much from the mural paintings found in houses at Pompeii, Herculaneum, and Rome The pleasing coloring, which in many of the paintings still remains fresh and vivid, and the freedom and vigor of the drawing, would seem to indicate that even from these ancient days Italy was the home of painters of great talent Portrait painting especially flourished at Rome, where hack street corner artists became so common that one could have his portrait painted for a few cents These were more remarkable for their realistic than their artistic merit, as we know from several surviving examples.

Although the art of Rome loses in comparison with that of Greece, still it commands our admiration, and we owe the Romans a debt of gratitude for helping to transmit to us the art of the Greeks, who were their great masters







Trajan's Column is at once a sublime expression of Roman Art and of the dominating force of the conquerors of the World If you should go to Rome one of these days *you* will see it towering into the air nearly a hundred feet high Running around the shaft spirally in 23 tiers are some 25 000 figures done in relief They represent the victories of the emperor Trajan. Portions of this relief are shown on each side of our picture Under this column in a golden urn, the ashes of the Emperor were buried. On the summit there was originally a colossal bronze statue of him, which Pope Sixtus V replaced with the figure of St. Peter.

The GOLDEN SPEECH and BOOKS of CLASSIC GREECE



Typical of the spirit of Greece is this painting, by Alma-Tadema, showing the poet Sappho, seated at the left, listening to the music of a lyre. The beauty of the fragments which we have of her work fully justifies the esteem in which the Greeks held her.

GREEK LANGUAGE AND LITERATURE. If Solon and Pericles could wander back from the Elysian Fields and sit down in some café of modern Athens they would probably be surprised to find how easily they could read the morning paper. Of course, it would take them a minute to focus their eyes on the print, so much smaller than anything done with the reed pen of their day, and they would find the shape of some of the letters changed or standardized. They would find many new words, and perhaps they would accuse the journalist of careless grammar. But all the same the literary Greek of today is perfectly intelligible to anyone who knows his Greek of 2,500 years ago. Their greatest trouble would be in ordering breakfast and talking with people about them. For many words concerning the intimate things of daily life were borrowed during medieval and modern times from the Italians, Turks, or other neighbors, and the pronunciation is so changed as to make modern spoken Greek almost unintelligible to one acquainted with only the classical tongue.

Greek nevertheless should be considered not as a dead language but as a living one. The Greek schoolboy can read the literary masterpieces of 2,500 years ago far more easily than we can read Chaucer. And the Greek language is living not only among modern Greeks, but in the up-to-date speech of America and the rest of the world. When we want to make a new word for a new thing we are likely to borrow from the Greek. For example, "osteopathy," "phonograph," "telegraph," "telephone," "automobile," "periscope," "photograph," and scores of other words that have found their way into our dictionaries to name modern inventions and developments of science are formed directly from old Greek words. Nor are we indebted to Greek only for these "made" words. Many are also woven into the very warp and woof of our language, as is told in the article on English Language. So, if you know Greek, you can often see at a glance the meaning and pronunciation of a word that would otherwise make you gasp—"anthropomorphic," for instance, which comes from the Greek words for "man" and "form," meaning therefore "man-formed" or "manlike."

But even if Greek were as dead as Sanskrit from the viewpoint of modern life, still it would be worth while for us to study it. For of all the languages of the world, the most beautiful is Greek as it was written 20 centuries or more ago. It was graceful and harmonious, full of light and shade and color, subtlety and music. It could pile words together into compounds with as great abandon as German does nowadays—only the words were prettier to begin with—or it could sail along with little words like a lightly moving skiff.

Moreover in this superb tongue was written one of the most wonderful literatures of all time. Of this literature we can only get half an idea even through the most careful translations. Poetry is always hard to translate, but Greek poetry loses more than perhaps any other, since English often takes two or three times as many words to say the same thing. A prose

translation of Homer is therefore clumsy and a translation in English verse is inadequate Neither gives any idea of the simplicity and resonance and movement the inevitability which never becomes monotony The lyrics are even harder to translate though Swinburne and Tennyson have produced free renderings of great beauty which give the English reader some notion of the *qualities* of the *originals*

Greek prose also loses much by translation for Greek is a so much subtler instrument of expression than English that you would need a foot note to almost every word of a translation to explain the exact shade of meaning that your Greek author intended The Greek particles for instance little words only a letter or two long and amounting only to a slight gesture of the hand or the flicker of expression on a person s face must be translated in English by some such awkward word as *moreover* A translation makes things tedious where the Greek expresses them compactly This of course is because Greek is a rather highly inflected language A single word of perhaps no more than two syllables in Greek may become a whole sentence with us

A SCENE FROM GREEK TRAGEDY



This painting by a modern German artist interprets a moving scene in the play 'Oedipus at Colonus' written by that mighty tragic poet Sophocles The blind old Oedipus formerly king of Thebes but now a wanderer on the face of the earth has just addressed to his daughter Antigone the opening line of the tragedy Child of a blind old man Antigone what country reach we?

The oldest Greek literary works that we have are the Iliad and the Odyssey of Homer which the world still acknowledges as the most splendid examples of epic or narrative poetry People used to wonder how first poems could be so *perfect and so* great as the Iliad and the Odyssey The explanation is *of course that these* were not the first poems They *come from an age that* was already rich in folk poetry—hymns to the gods and marriage hymns and lays telling the deeds of ancient heroes *In that age* however the Greeks had no writing and of all the songs that the wandering bards carried from city to city and recited from memory only the Homeric poems survived to be written down The only exceptions are a few of the so-called *Homeric hymns—the* invocations to Apollo or some other god with which it was customary for the singer to prelude his recitation of the Homeric stories themselves The article on Homer tells you about these thrilling tales of adventure and also indicates where in these volumes you may find some of these stories retold

From a slightly later period we have the poems attributed to Hesiod Hesiod is a much more definite figure than Homer He lived at the wretched hamlet of Ascra near Mount Helicon in Boeotia probably in the 8th century B C and drew many faithful pictures of the dull poverty stricken country *life* he knew so well Homer and Hesiod together made a sort of bible for the Greeks—Homer telling the story of the heroic past and Hesiod dealing with the practical realities of daily *life setting forth* homely maxims and precepts for the farmer in his Works and Days and in the Theogony piecing together the old legends to form a systematic account of creation and the gods

With the 8th and 7th centuries we come to the beginnings of the historical period The old ways of life were giving way to new Commerce discovery colonization political change widened the horizon of the Greeks and quickened their feeling and imagination To express the thoughts and feelings aroused by this fuller and more interesting life new literary forms were invented—all still in verse however for prose had not begun to be used as a literary medium Instead of the rapid flowing hexameter (a line of six measures) so well adapted for narration the poets

of the 8th and 7th centuries used the meter called "elegiac," which lent itself to direct self-expression on almost any theme—patriotism, war, mourning, or political reflection—and the "iambic" meter, which was especially adapted to pointed personal utterance, usually of a satirical nature. With these forms are associated such names as Archilochus, Mimnermus, and Solon, the great lawgiver of Athens.

More varied, flexible, and complex than these forms of verse was the type which the Greeks called "melic" and we call "lyric," because it was sung to the accompaniment of the lyre or the flute. With a free rhythmic structure, capable of the most subtle variation, Greek lyric reached a degree of artistic perfection never surpassed. Religious and processional hymns, odes of victory, dirges, wedding songs, drinking songs, love poems, were poured out by artists of exquisite skill, most of whom are known to us only by fragments. Greatest of them all was Pindar (518–446?), whose magnificent odes yield the scholar a pleasure which alone is enough to recompense for the labor of learning the Greek language. Sappho, who wrote about a century before Pindar, is generally esteemed as the greatest of all women poets. Her "every word," a famous critic says, "has a peculiar and unmistakable perfume, a seal of absolute perfection, and inimitable grace."

"TO Greece we owe the love of Science, the love of Art, the love of Freedom. The Greek genius is the European genius in its first and brightest bloom. From a vivifying contact with the Greek spirit Europe derived that new and mighty impulse which we call Progress. If we reckon up our secular possessions, the wealth and heritage of the past, the larger share may be traced back to Greece."—S. H. Butcher.

"The Greeks, we should never forget, were the first people to show the world what real freedom and real civilization were. And they brought, not only Politics, but Art and Science and Literature of every kind to a higher pitch than any other people ever did without borrowing from others."—E. A. Freeman.

"The thoughts of the great Greek thinkers have been bearing fruit in the world ever since they were first uttered. In some special sciences, the work done by the Greeks remains a basis of study to this day. In Greek literature we have the fountain-head of all Western literature."—R. C. Jebb.

As the Greeks invented the epic and lyric forms, and brought them to a perfection which has never been surpassed, so too they invented the drama (considered as a literary form) and produced the masterpieces which are still reckoned as the drama's crowning achievements. In the crowded glorious age which followed the repulse of Persia (490–479), the awakened national consciousness of Athens found expression in a series of superb tragedies which have never been equaled except perhaps by a few of Shakespeare's. The story of how the simple choral songs and dialogues performed at the festivals of the god Dionysus flowered into the majestic tragedies of Aeschylus, Sophocles, and Euripides, and how each made improvements in the dramatic form, is told in the article on Drama.

The religious character which was impressed on Greek drama by its origin was never lost. It was acted only at the festivals held in honor of Dionysus, and wealthy citizens were chosen to bear the expense of costuming and training the chorus as a public and religious duty. Attendance at the performances was an act of religious worship, and in the time of Pericles the state itself gave poor citizens the price of admission to the great open-air Theater of Dionysus (*see* Theater) that none might be debarred by poverty. All the greatest poets of the day competed for the prizes which were offered for the best plays.

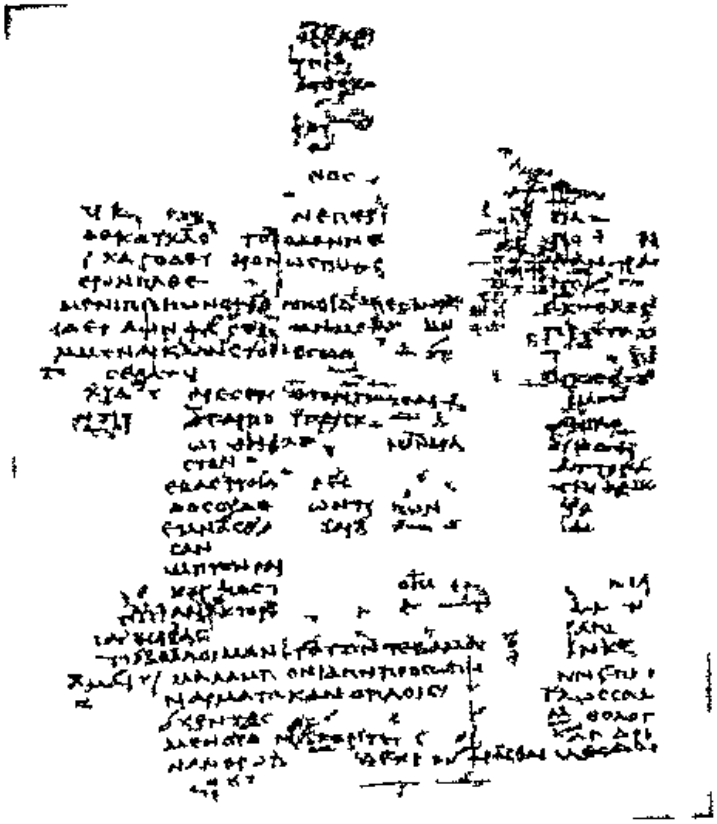
The earliest of the three great Attic writers of tragedy was Aeschylus, who was born in 525 B.C. and was present at the battles of Marathon and Salamis. He wrote between 70 and 90 plays, of which 7 remain. Many of his dramas were arranged as "trilogies," that is, groups of three related plays. The 'Oresteia' (story of Orestes), consisting of the 'Agamemnon', 'Choephori' and 'Eumenides', is the only trilogy that has survived from ancient times. The 'Persae' is a song of triumph for the defeat of the Persians. The 'Prometheus Bound' is a colossal rendering of the legend of the superhuman benefactor who stole fire from heaven for men (*see* Prometheus). For rugged power, sublimity of idea, and ethical grandeur Aeschylus stands without a peer.

For some 16 years, between 484 and 468, Aeschylus carried off prize after prize, but in 468 his place as the favorite poet of Athens was taken by a man some 30 years younger, Sophocles of Colonus (496–406 B.C.). Sophocles' long life covered practically the whole period of Athens' greatest glory. He won more than 20 victories at the Dionysia, and produced more than 100 plays, 7 of which are extant. Sophocles "saw life steadily, and saw it whole." This serenity of attitude together with the supreme skill with which his dramas were constructed, the beauty of his language and the nobility of his characters, give us a sense of majesty and harmony such as we find nowhere else in literature. He was the most Greek of all the Greek poets. His plays have been compared to the Parthenon for their power, self-restraint, and symmetry. The 'Antigone', which is perhaps the most celebrated drama in Greek literature, is typical of Sophocles' work. Its heroine is a model of womanly self-sacrifice, and underlying the whole tragedy is the sublime idea of a higher unseen law ruling the destinies of men. Others of his plays are 'Ajax', 'Oedipus Tyrannus', 'Electra', and 'Oedipus at Colonus'.

The third of the great tragic writers is Euripides (480–406 B.C.), who was born on the island of Salamis

—so the story goes—the day of the famous battle against the Persians Although he presented his first play at 25 he did not take the prize until he was 39 and won it only five times in all in spite of his 92 produced plays The reason for this is that he was a modern among the ancients He questioned the popular idea of religion and he drew real men and women instead of gods or demigods or idealized human beings of heroic stature For this reason Aristotle calls him the most tragic of the poets for his plays being the most human were also the most moving The conservatives of his own generation did not approve of him but in later times he was exalted to a place with Aeschylus and Sophocles His plays are more often performed on the modern stage than those of any other Greek poet Eighteen plays have survived including Alcestis Medea Hippolytus the Trojan Women Orestes Electra Iphigenia at Aulis, and the Bacchae

A FRAGMENT OF SAPPHO'S POETRY



Very little of Sappho's poetry has come down to us The character of her work is known largely through brief quotations from her poems found in the writings of other authors Three fragments were found on Egyptian papyri have been discovered in recent years one of which is here reproduced

From Greek comedy only the plays of one man have survived—those of Aristophanes (about 448–380 B.C.) who was for 40 years the great burlesque critic of Athenian life His comedies are gay fun making about the things of his own day always from the standpoint of the conservative He ridicules the new learning in the person of Socrates and savagely lashes Euripides who stood for the inquiring innovating attitude that he particularly hated Socialism women's rights the Peloponnesian War the fondness of the poorer citizens for serving on juries now that Cleon had raised their pay to ten cents a day—these and other aspects of current Athenian life served as subjects for his stinging sarcasm and boisterous humor Eleven of his plays survive including the Knights, Clouds, Wasps, Frogs Ecclesiazusae (Women in Parliament) Lysistrata and Birds

As always in literary history Greek prose was late in developing In the 6th century some of the early philosophers formulated their ideas in brief sententious prose maxims but the first truly literary use of prose is in the History of Herodotus written about the middle of the 5th century (*see* Herodotus) The theme of Herodotus is the struggle between East and West culminating in the Persian Wars His great successor Thucydides (about 471–396) told the story of the Peloponnesian Wars Thucydides critical use of sources his inclusion of documents his laborious research into the roots of events make him the most modern of the Greek historians— the first philosopher of history —far removed from the romantic inclusiveness of Herodotus or of Xenophon (*see* Xenophon)

The 5th century also saw the rise of another prose art the art of oratory with its companion art of rhetoric which taught the technique of making successful speeches With the establishment of democracy in Athens and other Greek cities the ability to make convincing speeches before the popular assemblies and especially in the law courts became of the greatest practical value Litigants were usually compelled to plead their own cases instead of hiring others to plead for them so rhetoric became part of the ordinary education of the youth and a new profession arose—that of the writer of speeches for men to speak in their own behalf A large proportion of the speeches of the Attic orators that have come down to us were meant to be used in this way The 4th century was the golden age of oratory made memorable by the polished and artful speeches of Lysias Isocrates Aeschines and the master orator of all time Demosthenes (*see* Demosthenes)

The same lively curiosity and insatiable interest in the spectacle of the universe which led the Greeks to invent epic and lyric verse drama and history also made them the first philosophers Their craving to find a reasoned answer to the riddles of life resulted in the creation of another department of prose literature represented chiefly by the great names of Plato and Aristotle Beginning with the 6th century one thinker after another advanced his theory of the

material causes of the universe, of knowledge, and of conduct. Many of the fragments of their teachings which have been preserved in the form of terse epigrammatic statements in prose or verse seem crude and childish to us today, but they serve to remind us how long and toilsome is the road that leads to wisdom. (*See* Pythagoras.) The first thinker to lay a really scientific basis for philosophical inquiry was Socrates (469–399 B.C.), whose tireless questioning into the roots of conduct and searching criticism of all traditional doctrines so outraged the orthodox and narrow-minded that he was put to death (*see* Socrates). He wrote nothing himself, but his great pupil Plato (427–347) perpetuated and developed his teaching in a matchless series of dialogues, packed with fresh and stimulating ideas which have inspired every philosophical thinker since his day (*see* Plato). Third of the immortal trio of Athenian thinkers was Plato's pupil, Aristotle, the father of science. Aristotle sought to map out nearly the whole field of human knowledge into the various sciences, laying a foundation for all later scientific inquiry. In the history of literature, his work cannot rank with the superbly artistic Platonic dialogues, but in the history of thought he is acknowledged as "the master of those who know." (*See* Aristotle.) Theophrastus, who succeeded Aristotle as head of the school called the Lyceum, is chiefly remembered for a series of lively character sketches which have found imitators in every age.

With these names the story of classical Greek literature ends, but the Hellenistic age in Alexandria offers us a second rich library (*see* Alexandria, Egypt). The name that stands out in poetry is that of Theocritus, who wrote exquisite little shepherd dialogues picturing the rural life of his native Sicily. Imitators from Vergil to our own day have tried in vain to recapture the freshness and charm of the pastoral form as Theocritus first used it. Other poets of this age are the lyric poet Callimachus; Bion and Moschus, writers of pastoral verse; and Apollonius Rhodius who wrote the Argonautica, an epic in four books on the quest of the Golden Fleece. Greek prose, too, continued to flourish far into Roman times, and from these later days we have our first forerunners of the novels (*see* Novel), as well as important works of geography and history.

The most noteworthy of these later writers are the historians Polybius, Diodorus Siculus, Josephus, and Appian; the geographers Strabo and Pausanias; the biographer Plutarch, who has given us more general information about antiquity than any other single writer (*see* Plutarch); the critic Longinus, to whom is assigned one of the best of all works of literary criticism, the treatise 'On the Sublime'; the humorist Lucian, whose 'Dialogues of the Gods' are almost as outrageously laughable as a comedy of Aristophanes; and the two Stoic philosophers Epictetus and Marcus Aurelius, one a slave and the other an emperor (*see* Epictetus; Marcus Aurelius Antoninus).

In various localities the Greek language was spoken and written with variations sufficiently great to cause three chief dialects to be recognized, though the differences were never so great as to cause difficulty of communication. The Ionic dialect, the language of Homer and Hesiod, was spoken in most of the Aegean islands and on the west coast of Asia Minor. With a few modifications, the Ionic is identical with the Attic, the principal literary dialect, used in the works of the great Attic writers. The Doric, the language of Pindar and Theocritus, was spoken at Corinth and throughout most of the Peloponnesus. The Aeolic, in which Sappho wrote, was spoken in Boeotia, Thessaly, and Aeolis (northern Asia Minor).

In modern Greece there is a sharp cleavage between the dialect of the people, called "Romaic," and the literary language, which represents an attempt to return so far as possible to the standards of classical Greek. The struggle between the "purists" and the adherents of the popular tongue is still waged with so great bitterness that in 1901 20 persons were killed or injured in a mass meeting of protest against the proposed issue of a translation of the Gospels into Romaic. The style of most current literature and journalism represents a compromise between these two ideals, but the most powerful poetry and fiction are written in the "vulgar" tongue.

GREELEY, HORACE (1811–1872). If it is true that "the pen is mightier than the sword," then Horace Greeley, the newspaper man, might possibly be considered greater than Grant and Lee or any other general of the Civil War. Not only was he the greatest molder of public opinion in the period preceding and during the war, but he was probably the greatest journalist America has ever produced. Because of the importance of his work the poet Whittier called him "our later Franklin."

Greeley was, in his own words, "born in poverty, cradled in obscurity, and early called from school to rugged labor," but he sought "to convert obstacles into opportunity, and wrest achievement from difficulty," and his efforts were successful.

Born in New Hampshire, he learned the printing trade in Vermont, and later joined his parents in western Pennsylvania. In 1831 he went to New York with $10 in his pocket and his clothes in a bundle carried over his shoulder. After several newspaper ventures which brought him much notoriety but little money, he started the *New York Tribune*, as a Whig daily, in 1841.

The success of this paper was immediate, and its circulation soon covered the country from the Atlantic to the frontier of Missouri. In its columns Greeley opposed slavery, advocated a high protective tariff, and aided the temperance movement. At the outbreak of the Civil War he urged the government to refrain from "pinning one section to another by bayonets." Afterwards he was an earnest upholder of the government, and he urged the emancipation of the slaves even before Lincoln was ready for that step.

After the war was over Greeley wished the country to treat the South leniently. To set an example he signed the bond by which Jefferson Davis was given

FORECASTING EUROPE S WEATHER AT A GREENLAND OUTPOST



1 the second Wo d War the United States A my A Fo ce set up these Quonset hut weather stat ons to repo t sto ms mov ng toward Europe which m ght affect bomb ng missions and nvas on plans Af er the war they served the comme cial a lines

ms freedom He could not carry the country with him in this attitude however and in 1872 when he was the cand date of the Liberal Republicans and the Democrats against Grant he was d sastrously defeated Borne down by political and domestic misfortune he fell ill and died Nov 29 1872

In spite of the su cess of the *Tribune* and the large sum Greeley made on the lecture platform he was never wealthy because he always aided everyone who asked him for help He was extremely simple in his habits and careless in his dress H s handwr t ng was so poor that it was the de pair of typesetters on the newspapers For brilliancy of mind and high moral courage he was unsurpassed among the men of his day

GREENE NATHANAEL (1742–1786) By common consent the brilliant general Nathanael Greene is regarded as a military leader second to Washington alone in the American Revolution His father was a blacksmith in P otowomut R I but a Quaker preach er on Sundays and trained his son in the strict principles of that sect When the quarrel between the colonies and England was growing hot Greene joined the militia For this martial zeal he was ex communicated by the Friends Church His military training won him a brigadier generalship and the command of the Rhode Island forces in 1775 He marched his troops to Cambridge after the skirmishes at Lexington and Concord and welcomed Washington as the new commander in chief in July 1775

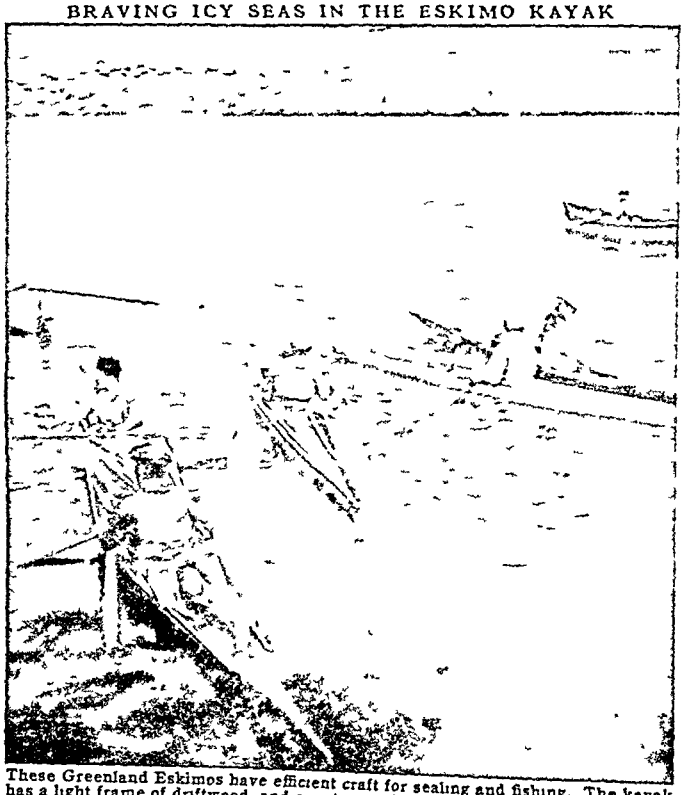
Greene speedily won the fr endsh p and confidence of Washington under whom he served with dist nction at Trenton Princeton and Brandywine At Washington s request he accepted at *Valley Forge* in March 1778, the difficult position of quartermaster general, retaining however, the right to command troops in the field Because of the meddling of Con gress with the affairs of his department Greene resigned his position in 1780, but was shortly afterwards appointed by Washington as commander of the Army of the South When Greene succeeded Gates in this command he found the army in so wretched a state without disc pline arms or clothing that he could not bring it into condit on for fighting until 1781 As soon as this had been accomplished he began a campaign which in less than a year stripped the English of all their conquests in the Carolinas and Georgia except Charleston in which he penned up the British army for the rest of the war For this he received the thanks of Congress large grants of land from the Carol nas and Georgia and the name of the man who saved the South in the American Revolution

GREENLAND Perhaps four fifths of this the largest island in the world is bur ed under an ice-cap t l at averages 1 000 feet in depth The area of Greenland is variously estimated at from 735 000 to 1 250 000 square miles It is more than 1 600 miles long with a maximum width of between 600 and 800 miles Men can live only on the rocky coastal fringe chiefly in the southwest Except for one or two tiny settlements the east coast is uninhabited

The west coast is warm enough to support tundra vegetat on with a few stunted birches and willows The Greenlanders who are Eskimos with a mixture of European blood support themselves chiefly by hunting seals whales walrus bear and fox and by fish ing for cod hal but and salmon (*see* Eskimos) Potatoes and other root crops are grown but even the hard est of grains—barley—will not ripen here and is grown only as fodder for the few goats sheep and cattle The houses are mostly of stone and sod for lumber has to be imported A few Eskimos build snow igloos for the winter or when traveling

Lying to the northeast of North America and al most wholly within the Arct c Circle Greenland is subject to intense cold terrible blizzards and almost constant fog Flowing down from Greenland s icy mountains glaciers discharge a billion tons of ice

BRAVING ICY SEAS IN THE ESKIMO KAYAK



These Greenland Eskimos have efficient craft for sealing and fishing. The kayak has a light frame of driftwood, and a waterproof covering of sealskin. It is decked over except at the center, where a sealskin apron is laced around the fisherman to keep out the water. His spear and harpoon fit into loops on the deck and his sealing line is coiled on the raised platform before him.

into the sea every year (*see* Glacier). Many of these enormous icebergs are carried down into the lane of ocean travel, where they are a constant menace to navigation in spring and summer (*see* Icebergs).

The Greenlanders have to import much of their food, clothing, and other necessities. The most valuable export is cryolite, a scarce mineral mined nowhere else. It is used in separating aluminum from its ores and in making glass and enamelware. Other exports are whale and seal oil, fish products, eider down, and skins. There are schools in all the settlements and nearly all the people can read and write.

At the end of the 10th century Eric the Red, exiled from Iceland, sailed to the southwestern coast of Greenland and founded a colony. He apparently gave it the inviting name of Greenland to attract settlers from Iceland. In 1261 the colony came under Norwegian rule. Communication with Norway ceased in the 15th century and Greenland became lost to the world until the close of the 16th century, when it was rediscovered by English explorers. In 1721 Hans Egede, a missionary, began a modern colonizing movement. When Norway and Denmark dissolved their union in 1814, Greenland was not mentioned, and so Denmark kept it. In 1933 the World Court disallowed Norway's claims to the east coast. In recent decades Greenland has been a favorite field for explorers and a stepping-stone for exploration of the north polar regions (*see also* Polar Exploration; Peary). After the Germans invaded Denmark in the second World War, the United States took responsibility for the island's people and defense.

European weather is influenced by meteorological conditions in Greenland. Secret German weather stations were hunted out and destroyed. The United States established stations of its own and several military airfields. After the war, rule of the island was restored to Denmark; but the United States increased and improved its weather stations and military airfields. Population (1945 census), 21,412. Included are some 500 Danish officials, traders, miners, clergymen, and teachers.

GREGORY, POPES. Sixteen popes, two of them among the greatest the church has produced—have borne this honored name.

GREGORY I, called the Great (540?-604), was a Roman, of old family and great wealth. He became a Benedictine monk in a monastery which he himself endowed. Britain attracted his interest when he saw English boys sold as slaves in Rome. Soon after his election as pope, in 590, he sent St. Augustine to England as a missionary. He repeatedly had to defend Rome against the Lombards. Gregory left many writings on monasteries and missionary work. He supervised the compiling and editing of the church music known as the Gregorian chant. In restored form this is the official liturgical music of the Roman Catholic Church today. It is generally believed that Gregory did much of the editing himself, particularly on the music for the mass. He was one of the ablest of the popes, and after his death was made a saint.

GREGORY VI (died 1047) earned a high reputation for learning and uprightness. He was deposed, however, by a council held by Emperor Henry III on the ground that in a time of confusion he had obtained his office by improper means.

GREGORY VII was the mighty Hildebrand (*lived* 1020-1085). After being the power behind the throne for a quarter of a century, under five popes, he was chosen pope in 1073. His pontificate is memorable for the beginning of the great Investiture Conflict with the Emperor Henry IV of Germany. His purpose was to create a sort of international league with the pope at its head. A Catholic historian sums up Hildebrand's ideas in these words: "Seeing the world sunk in wickedness and threatened with impending ruin, and believing that the Pope alone could save it, he conceived the vast design of a universal theocracy, which should embrace every kingdom of Christendom, and of whose policy the Ten Commandments should be the fundamental prin-

ciple Over this commonwealth of nations the Pope was to preside The spiritual power was to stand related to the temporal as the sun to the moon imparting light and strength without however destroying it or depriving princes of their sovereignty

After a violent conflict Henry IV was obliged to humble himself barefoot and fasting before the pope at Canossa (1077) But the struggle soon recommenced Henry attacked the pope in Rome itself Only the aid of the Norman Robert Guiscard permitted Gregory to retire from Rome to Naples He died at Salerno shortly after saying I have loved justice and hated iniquity therefore I die in exile

GREGORY IX (pope 1227-41) is memorable chiefly for his conflict with the Emperor Frederick II GREGORY XI (pope 1370-78) was a French churchman who instituted many reforms and transferred the papacy back to Rome from Avignon where it had been for 70 years GREGORY XII (pope 1406-15) upheld the rights of the Roman pontiffs against the Avignonese antipope Benedict XIII in the time of the Great Schism GREGORY XIII (pope 1572-85) established the New Style calendar in place of the Julian calendar (*see* Calendar) GREGORY XVI (pope 1831-46) encouraged learning and founded the Egyptian and Etruscan museums in the Vatican

GRENFELL SIR WILFRED THOMASON (1865-1940) In 1892 a young English doctor named Wilfred Grenfell arrived in Labrador His mission in this bleak northern land was to aid the poor fisherfolk living there He carried on this task of mercy for more than 40 years When he died Grenfell of Labrador as he was called left healthy growing communities where disease *privation* and ignorance had receded



GRENFELL
The Doctor Missionary

Grenfell was born Feb 28 1865 at Parkgate near Chester the second son of a well to-do schoolmaster He attended Oxford University and then entered London Hospital to study medicine There he saw many seamen who lacked medical aid and religious comfort during their voyages in the North Sea To help such men Grenfell fitted up an old sailing vessel as a mission ship He roamed with the deep-sea fishing fleet for five years His work won such fame that he was selected to lead an expedition to Labrador to investigate the opportunities for service there

He found the people—Indians Eskimos and descendants of early settlers from Great Britain—living in ignorance and poverty Across a thousand miles of dreary coast line he established hospitals *nursing* stations schools agricultural and trade cooperatives and churches Every summer his hospital ship cruised along the coast stopping wherever a *signal flag* indicated distress In the winter a dog sled was his ambulance His only long absence from his people occurred during the first World War when he served in France as a major in the Harvard Medical Unit

His cause set forth in lectures and books won widespread support The International Grenfell Association founded in 1912 raised money and won recruits mostly Americans to carry on the work

Dr Grenfell had an able assistant and devoted companion in his American wife Anne MacLanahan Her beauty and wit had so impressed young Grenfell that he proposed to her during an ocean voyage before he knew her name

Grenfell was knighted in 1927 by King George V

The best book on Dr Grenfell's life and work is his autobiography Forty Years for Labrador (1932) Among his other books are Adrift on an Ice Pan (1909) The Adventure of Life (1912) Labrador Days (1919) Deeds of Daring (1934) and The Romance of Labrador (1934)

GREY LADY JANE (1537 1554) Beautiful intelligent and sweet tempered Lady Jane Grey was the innocent victim of conspiracies by her father and other nobles to put her on England's throne to secure power for themselves The Privy Council proclaimed her queen when Edward VI died in 1553 She was then only 16 After nine days as queen she became a prisoner in the Tower of London and Mary oldest daughter of Henry VIII had the throne Lady Jane died on the scaffold eight months later

Lady Jane was the daughter of Henry Grey Duke of Suffolk and of Frances Brandon niece of Henry VIII When she was nine years old she entered the household of Henry VIII as an attendant on Queen Catherine Parr Henry died in January 1547 and a few months later Catherine married Lord Seymour After Catherine's death in September Lord Seymour and Jane's father tried to arrange a marriage between Jane and King Edward VI Edward like Jane was then 11 This first scheme to make Lady Jane the queen failed and Jane returned to her father's home

Her tutor there was John Aylmer later bishop of London Jane's family had always been severe with her but Aylmer was gentle and kind Jane proved an apt pupil At 13 she could read and write Greek By the time she was 15 she also knew Latin Italian and French and was learning Hebrew

The second plot to put Jane on the throne developed early in 1553 This time the guiding spirit was John Dudley Duke of Northumberland King Edward had shown signs of fatal tuberculosis In May Lady Jane was married to Guildford Dudley Northumberland's son Then Northumberland induced the young king to name Jane his successor in place of Edward's sister Mary Edward died July 6 On July 9 Northumberland took Jane before the Privy Council and had her proclaimed queen The scheme collapsed when the rest of the country proclaimed *Mary the queen*

Jane was imprisoned and convicted of treason That winter her father joined an uprising against Queen Mary This led the queen to sign Jane's death warrant. Jane and her husband were beheaded Feb 12 1554 On the scaffold Jane declared that she had not wanted the crown and died a true Christian woman

GRIEG (grēg), EDVARD HAGERUP (1843-1907). The rhythms and melodies of Norwegian folk music stirred the poetic imagination of Edvard Grieg. He wove them into songs and instrumental music that won him fame as Norway's greatest composer.



EDVARD GRIEG

Grieg was born at Bergen, Norway, June 15, 1843. His great-grandfather, a Scottish merchant, had emigrated to Norway in 1746 and had married a Norwegian girl Grieg's grandfather and his father, Alexander Grieg, both served as British consul at Bergen. Grieg's mother was Gesine Hagerup, daughter of the mayor of Bergen. She played the piano brilliantly, appearing as soloist at many concerts.

Edvard's mother began to give him piano lessons when he was 6 years old. He learned well and started composing when he was about 12. The summer he was 15 the famous violinist Ole Bull visited the Grieg home. He insisted that Edvard play his compositions and then persuaded the boy's parents to send him to the Leipzig Conservatory to study music. Young Grieg worked so hard there, and for such long hours, that his health broke down. Pleurisy destroyed his left lung. Nevertheless he graduated with honors in 1862. For the next three years he lived chiefly in Copenhagen. There he became the close friend of Richard Nordraak, a young composer who was eager to establish a true Norwegian music. Nordraak died in 1866, at 23, but his ideas had a lasting effect on Grieg.

Inspiration for many of Grieg's best songs was his cousin, Nina Hagerup, whom he married in 1867. She was a concert singer and helped to make his music known throughout Europe. They had one child, a girl, who died when she was 13 months old

Grieg became conductor of the Philharmonic Society at Christiania (now Oslo) in 1867. In 1874 the Norwegian government granted him a small annual pension. This enabled him to give up conducting and devote himself to composition. In 1877 the Griegs built a studio home in the open rugged country at Lofthus on Hardangerfjord. The home where they lived longest —from 1885 until Grieg's death—was the villa Troldhaugen in the hills about six miles from Bergen.

Frail health had handicapped Grieg since his early attack of pleurisy. He died Sept. 4, 1907, of heart disease. More than 40,000 sorrowing people crowded the streets of Bergen on the day of his funeral.

Grieg's piano concerto in A Minor, his 'Peer Gynt' suites, and the song 'Ich liebe Dich' are among his best-known works. He wrote the music for 'Peer Gynt,' Henrik Ibsen's poetic drama, at Ibsen's invitation. It includes 'The Death of Aase', 'Anitra's Dance', and 'Solvejg's Song'. Grieg's first violin sonata (in F Major), written in 1865, won a generous letter of praise from Liszt. This letter helped attract the attention of the Norwegian government to Grieg's genius. Among Grieg's other works are more than 125 songs and 66 lyric pieces for piano in 10 books

The Brothers GRIMM, *Collectors of* FOLK TALES

GRIMM, JAKOB LUDWIG KARL and WILHELM KARL. All over the world children have grown up with Grimm's Household Tales. They are among the world's best-known stories and have been translated into many languages. Almost everyone knows 'Snow White and the Seven Dwarfs', Rapunzel of the long hair, Rumpelstiltskin with his mysterious name, and Briar Rose who slept for a hundred years.

Not so many people know the lives of the Grimm brothers and how they went about the countryside together listening to these folk tales as they were told by men and women who had heard them from their mothers and fathers. For it was the Grimm brothers who first collected and wrote these stories and so started the first scientific interest in folklore. To the scholars of their time the two brothers were best known for what they contributed to knowledge of the origin and growth of the German language. So they were known as philologists.

Boyhood of the Grimms

Jakob Grimm was born on Jan. 4, 1785, at Hanau in Hesse-Cassel. Wilhelm was born on Feb. 24, 1786; so the brothers were only about a year apart in age. They were two of six children. Their father, a lawyer, died when they were quite young, leaving them to the care of their mother. An aunt, their mother's sister, helped them financially. Jakob and Wilhelm grew up in Germany when that country was a loosely-



JAKOB AND WILHELM GRIMM

organized federation of states Prussia and Austria were the leading kingdoms There were many small villages a few large towns poor communications and bad roads The peasants were held down and oppressed by large landowners

We know only a few facts about the childhood of the brothers A visitor to Germany of the period has written of the primitive villages Everywhere we saw the toy houses of our childhood magnified as it were to gigantic size There were vast forests which might have been peopled with dwarfs and gnomes Another visitor tells of the delightful way in which children and parents played together and says that every window however small is occupied by flowers ' He also describes the fairs that took place each year in every town of any size Housewives waited to buy household goods at these fairs An amusing old rhyme tells how

The German housewife hurries to the fair
To higgle for the price
of some small ware
Perhaps a broomstick or
an earthen pot
She knows that pennies
saved are pennies got

We may suppose that the widow Grimm took her children to some near by fair where there were mounds of toys mostly from Nuremberg We do know that Jakob and Wilhelm went to school together in Cassel They shared a room and were the greatest of friends

When they were older the brothers determined to study law as their father had done In 1803 they went to the University of Marburg Here Jakob studied under the famous law professor and scholar Savigny who interested him in the legends of the Middle Ages and in the songs of the minnesingers the German poet singers of the 12th 13th and 14th centuries Later Jakob worked with Savigny in the libraries of Paris Meanwhile Wilhelm had returned to Cassel where his mother was living and Jakob joined them there The two brothers became librarians Cassel lay between the Harz Mountains and Frankfurt It was here that George III of England obtained Hessian soldiers for service in the American Revolution

SCENES FROM OLD FOLK TALES





These pictures illustrate delightful scenes from old stories collected by the Grimms At the top a Doctor Know It All a poor woodcutter who becomes a famous doctor because of his wit and good luck At the bottom a Clever Else with her family Versions of the story are told in many lands The drawings are by Wanda Gag from Tales from Grimm (Coward McCann)

Later Jakob and Wilhelm moved to Gottingen in Hanover Jakob was a professor and librarian and Wilhelm an under librarian at the university They remained in Gottingen until 1837 when Jakob was exiled from Hanover for joining a group of professors in signing a protest against the unconstitutional acts of King Ernest Augustus Again the brothers returned to Cassel

Wilhelm had married Dortchen Wild in 1825 but this did not separate the Grimms Jakob continued to live in his brother's household and was as fond of Wilhelm's children as though they had been his own A few years later the two brothers went to Berlin where they were given professorships and were elected members of the Academy of Science Both of the brothers wrote learned books Jakob wrote many more than Wilhelm and his German grammar is one of the world's greatest works in language study Both worked on a dictionary of the German language and on the collection of folk tales

Collecting the Folk Tales

To the people of Hesse in middle Germany and in other near-by regions the quiet scholarly Jakob Grimm and the more friendly jovial Wilhelm must have become very familiar For they spent some 13 years in collecting from the lips of people the stories that went into their folk tales The first volume of Kinder und Hausmarchen (Nursery and Household Tales) was published in Berlin in 1812

By this time friends and relatives were also collecting stories and the brothers had the good fortune to find a woman who could tell many of the tales excellently She was Frau Viehmannin a peasant woman who lived near Cassel Wilhelm's wife was also very familiar with the old tales and some were presented as she told them So a second volume was published in 1815 and a third volume in 1822

What the Grimm Brothers Tried to Do

While the folk tales were intended for children as their first title suggests they were not originally told exclusively for children The Grimms stated in their preface As their simple poetry delights and their truth can interest anyone and because they remain an inheritance in the house they are also called House Stories

In collecting the stories the brothers were careful to keep them close to the original tales as told by the people. "Our first care was faithfulness to the truth." Frequently the dialect of a certain part of a particular section was kept, so that the stories should not lose their flavor. Sometimes there were several versions of the stories, and these the Grimms combined into one, making careful notes of what they had done.

It must have been difficult to choose between the different versions. Should Rumpelstiltskin ride around the fire in a ladle, or should he hop around it on one foot? Should a wolf or a witch live in the sugar house found by Hansel and Gretel? The notes appeared in an early English edition and are valuable, for in them we learn much about the stories, their origin, and their characters. The Grimms trace the origin of Briar Rose to the story of Brunhilde, and note elements of the stories that appear in many countries.

It is easy to see how the stories were kept alive by the German peasants of this time, the cowherd, the poor woodcutter, the woodcarver, who had no hope of rising above their station in life. How satisfactory, when one's main diet is coarse, black bread, to hear of a magic table "which satisfied all needs!" The tales are touched throughout with the gold that the peasants seldom, if ever, saw; "golden eggs," "golden feathers," a tree with leaves of gold. There were good and bad characters, strong contrasts between good and evil, but the Grimms state that "although there is a moral in the stories, that was not their object, and if it is there it easily grows out of them like fruit from a perfect blossom without any help from man."

Some of the tales are more perfect in form than others. Many of these were written down word for word as they were told by Frau Viehmännin, or "Gammer Grethel" as she was later called. She was well aware that she was a good storyteller and knew the gift was not granted to everyone . . . "She told her stories thoughtfully, accurately, with wonderful vividness . . . If required, she repeated them more slowly, so that, after some practise, it was perfectly easy to write from her dictation." This gives us a vivid picture of the brothers at work, writing eagerly, savoring the fine quality of the storytelling. The first English edition was illustrated by the well-known artist George Cruikshank.

How Hans Christian Andersen Met the Grimms

One of the most interesting sidelights on the Brothers Grimm is given by Hans Christian Andersen in his autobiography. When Andersen was in Berlin he went to visit the Grimms, confident that they would know him as a fellow storyteller. The maid servant asked which brother he wished to see and he replied "The one who has written the most."

"Jakob is the most learned," she said, and took him to the elder brother. Jakob, who lived almost entirely in the world of his books, had not the slightest idea who Andersen was, or what he had written. This so disturbed the Danish writer that he left without meeting the more out-going Wilhelm, who told him later "I would have known you!" Of his trip to Berlin Andersen would say sadly, "Grimm did not know me." On another visit he became friendly with "these two highly gifted and amiable brothers" and saw them almost daily. "Jakob Grimm," Andersen then wrote, "is one of those characters whom one must love and attach oneself to."

After Wilhelm Grimm died in Cassel on Dec. 16, 1859, Jakob gave tribute to him in a speech to the Berlin Academy, saying that the whole of their lives had been passed together. In 1863 Jakob died in Berlin, leaving to us the fine heritage of the folk tales.

GROSBEAK. "Fine feathers do not make fine birds," but often extremely fine birds have fine feathers. The rose-breasted grosbeak has beautiful black-and-white plumage with a rose-colored breast,



THE SPARROW MEETS HIS MATCH

The Sparrow has earned a bad reputation by driving away many of our song birds, but he soon learns to let the Grosbeak severely alone. Here a Grosbeak is driving a Sparrow away from a feeding log.

a lovely song, a happy manner, and a clear conscience, for he knows that the few green peas and berries in his crop have been paid for many times over (for illustration in colors *see* Birds). Even though he lacked beauty, song, and manners, his appetite alone would make him invaluable to the gardener, for with his plainly feathered mate and his hungry brood he will rid a bug-infested potato patch of the pests in short order and supplement the potato-bug diet with such caterpillars as army-, canker-, and cutworms. Does he not deserve a few berries and peas?

Quite as much can be said in favor of other grosbeaks, which is a common name for a group of the finch family with thick powerful beaks (hence the name grosbeak). All have bright-colored feathers, lovely songs, and appetites for harmful insects. The rose-breasted grosbeak is commonly spoken of as the grosbeak, but other species such as the pine and evening grosbeak equally deserve the name. They are from 8¼ to 9 inches long The females of all species are quietly colored The feeding and nesting habits are similar, except in the case of the pine grosbeak which eats no insects and feeds almost entirely on seeds of such trees as the pine, ash, and sumac. The nest of twigs and weed-stalks is built in trees. The spotted eggs are from three to five in number. The birds migrate south in winter, though the evening and the pine grosbeaks are found wintering as far north as Iowa, Illinois, and New England.

The cardinal is the most showy of the group (*see* Cardinal for illustration in color; *see* Birds) The rose-breasted grosbeak is a bird of the eastern United States and southern Canada It winters south to Cuba and Central America The evening grosbeak with its yellow and black coloring is found in Canada It often winters in the northern United States The black headed grosbeak of the Far West and Mexico has a neck and breast of tawny gold and black wings marked with white (for illustration in color *see* Birds) The blue grosbeak is a deep purplish blue the wings marked with chestnut It is found in the southern and western states The pine grosbeak of the western pine forests is a deep rose color It is also common in Europe Another European grosbeak is the hawfinch It has a crown and back of rusty brown gray under parts and black and white wings

Grosbeaks belong to the family *Fringillidae* Scientific name of rose-breasted grosbeak *Hedymeles ludovicianus* black headed grosbeak *H melanocephalus* blue grosbeak *Guiraca caerulea* evening grosbeak *Hesperiphona vespertina* pine grosbeak *Pinicola enucleator* hawfinch *Coccothraustes coccothraustes*

GROUND HOG From the southern United States to the Arctic Circle live the squirrel's chunky cousins the ground hogs They also go under the name of woodchuck and marmot Varieties of the common ground hog range throughout the eastern and central states and northward to Hudson Bay and the Yukon Valley

A typical ground hog grows over two feet long and weighs 8 to 12 pounds Clothed with coarse grizzly brown hair the animal has a rounded head heavy body stubby legs and a short bushy tail With its sharp rakelike claws it digs out a burrow in a hillside or field The burrow is from 10 to 25 feet long with several entrances and has a nesting chamber at the end Here the female gives birth to four or five cubs in the late spring

All summer the ground hog nibbles clover grass roots vegetables and grain with razor-sharp front teeth It grows round with fat During meals it sits up straight every few seconds nose quivering and small ears cocked for enemies At the first sign of danger it utters a shrill whistle that sends the family scooting into their burrow (For a picture of a family around a burrow *see* Nature Study) If cornered *the ground hog may fight fiercely* The bite can cause *a severe wound* In the fall the time varying with the season and the part of the country in which it lives the ground hog crawls into its burrow and hibernates until early spring The stored up fat keeps it alive (*see* Hibernation)

BREAKFAST ON ITS FRONT PORCH



This young ground hog is discovering the delicious flavors of grass and clover conveniently growing at the entrance to its burrow If tamed when young a ground hog may return to its master for food every spring after wintering in its burrow

Legend says it comes out every February 2 (ground hog day) to look for its shadow If it sees it the animal goes back to sleep for six weeks but if the day is cloudy and shadowless it stays outside anticipating an early spring The idea stems from an old European belief that a sunny Candlemas Day (February 2) means six more weeks of winter weather

The scientific name of the common ground hog is *Marmota monax* Closely related are the longer bodied marmots of the western mountains—the yellow bellied marmot *Marmota flaviventris* and the hoary marmot *Marmota caligata*

GROUSE This popular game bird has been hunted so eagerly that in some regions where it was once abundant it has been almost exterminated It is the

habit of these dull-plumaged birds to lie hidden in the grass until the dogs are upon them, then, with a sudden great whirring sound, and with almost the speed of an arrow, they rise before the eyes of the startled hunter, who must be both cool and quick if he is to bag his game.

The common colors in the plumage are brown, gray, and red, with touches of purple and dark green in some species. Generally the colors of the male birds are more pronounced. The dress of the female is an excellent example of what naturalists call "protective coloration" (*see* Protective Coloration). It is so nearly the color of her surroundings that, if she remains motionless on her nest among the grass and leaves, even a keen-eyed fox or hawk will pass her by. Some members of the grouse family that live in regions where snow is common change their sober summer coats for a winter plumage as white as the snowy wastes they inhabit, and grow downy feathers on their feet that keep them from sinking into the snow. Other species grow horny appendages from the sides of the toes to serve as their snowshoes.

The male birds are noisy wooers. During the mating season their peculiar love-calls may be heard ringing through the woods and over the prairie lands. These calls, which take the place of the mating song of singing birds, are dull booming sounds variously produced. Some species have a most extraordinary wing power and by rapidly beating the air or their breast feathers produce a sound that may be heard a mile or more. Other species are furnished with an air sac of loose skin which acts as a sort of bagpipe, for the bird inflates it to an amazing size; then, with a jerking of the head, he forces the air from it with a hollow "boom, boom, boom," which draws the female birds of their kind. These love "songs" are accompanied by much strutting about and spreading of feathers and by many fights among the cocks.

HOW THE GROUSE ATTRACTS ITS MATE

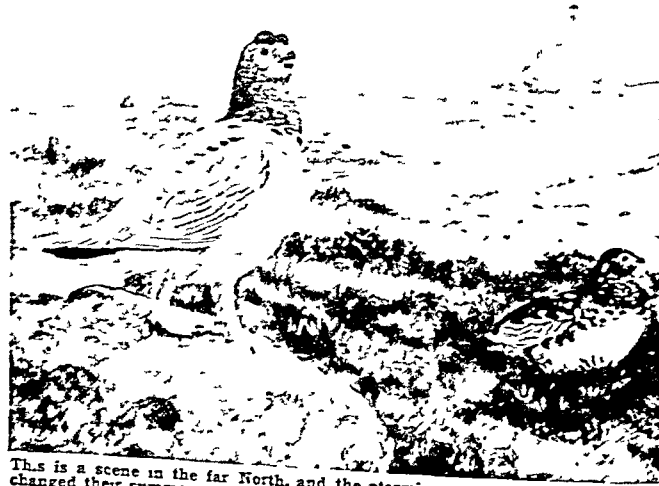


The male grouse, instead of singing to call his mate, perches upon a log and flutters his wings rapidly, producing a booming or drumming sound which can at times be heard a mile away.

Grouse range in size from the small white-tailed ptarmigan 13 inches long to the sage hen 30 inches long. They eat seeds, fruits, and insects. Among all the various species, except the ptarmigans, one cock mates with a whole covey of hens. The nest is on the ground and the hen takes entire care of the 10 to 14 eggs and of the young brood.

Of the North American species the best-known is the ruffed grouse, incorrectly known in the North as the "partridge" and in the South as the "pheasant." It is found across southern Canada and northern United States to the Pacific coast, and south to Georgia and Kansas. It is about 18 inches long and has tufts of shiny black feathers on each side of its neck, which look like a ruff and so give the bird its name. A crest of feathers adorns the top of its head. In the early days before this bird had come to know the ways

"SNOW GROUSE" IN THEIR WINTER CLOTHES



This is a scene in the far North, and the ptarmigans or "snow grouse" have changed their summer coats of grayish brown to their winter clothes of white.

of man it was so trustful that it would sometimes sit quietly until it was knocked from its perch with a club, and so it was often called a "fool hen." Once having learned the lesson of the dog and the gun, it became wise to an uncanny degree. A mother bird will try to entice hunters away from her brood by crying and fluttering along the ground as if wounded. The ruffed grouse is the state bird of Pennsylvania.

Franklin's grouse, which lives in the deep fir forests of the western mountains, is still the "fool hen." It regards man with friendly curiosity and will move slowly out of his way only to avoid being stepped on.

On the prairies of the Middle West from Canada to Texas, are found prairie chickens or pinnated grouse. Once they were numerous but these fast, straight-flying birds are tempting sport for hunters and are delicious food. They were shot down by the millions. At the same time the advancing farms and settlements destroyed their natural foods and coverts. Today their numbers and range are greatly reduced. With wise protection, however, they should escape the fate of the heath hens, which are now extinct.

The sage hen is the largest of the family. Its home is the barren alkali desert where it lives almost entirely on sage leaves. The old birds taste too strongly of sage, but the young are good food. They too face extermination.

The ptarmigan or "snow grouse," lives in the Arctic regions of America from Alaska to Labrador, but sometimes migrates in the winter to the northern states. In the autumn it changes its summer coat of grayish brown to a winter coat of pure white.

The red grouse, or moorfowl, is the famous grouse of the British Isles. It is so well protected by law that it is very plentiful, and sportsmen from all over the world go to Scotland every fall for grouse shooting.

The grouse belong to the order *Galliformes* which includes the guans, quails, pheasants, and turkeys. The scientific name of the ruffed grouse is *Bonasa umbellus*, of Franklin's grouse, *Canachites franklini*, of the prairie chicken *Tympanuchus cupido*, of the sage hen, *Centrocercus urophasianus*.

GUADELOUPE (*gwä-dĕ-lop'*). In the eastern arc of the West Indies lie the two islands that make up Guadeloupe. With five nearby islets, they form the largest overseas department of France in the Caribbean. The total area is 688 square miles. The western of the two islands is mountainous, the other, a low plain. The chief products are sugar, coffee, vanilla, cocoa, bananas, rum, and coconuts.

Guadeloupe has tropical beauty but is subject to hurricanes. Most of the people are Negroes and mulattoes, descendants of French colonists. The capital is Basse-Terre (10,086), but the chief town and port is Pointe-à-Pitre (41,323).

Columbus discovered Guadeloupe in 1493. The French settled there in 1635. England and Sweden gained brief possession of the islands. In 1946 France raised it from a colony to a member of the French Union. It now elects its general council. Population (1946 census), 278,464.

GUAM (*gwäm*). The rugged, tropical island of Guam rises in the Pacific Ocean about two thirds of the way between Hawaii and Manila. This strategic position makes Guam important as an air and naval base and as a stop for transpacific commercial planes.

Guam is the southernmost and the largest of the Mariana Islands. It was one of the first of the Pacific islands discovered by Europeans. Magellan landed on one of the Marianas, probably Guam, on March 6, 1521. He called them the Ladrones ("thieves") because the natives stole one of his boats.

The kidney-shaped island has an area of 225 square miles, about that of Chicago. It is 30 miles long and 4 to 8½ miles wide. Its underlying coral limestone is thinly covered with rich soil. Coral reefs ring the coasts. In the north cliffs rise abruptly into a plateau up to 600 feet above the sea. The southern half has rolling savannas, and on its west coast are hills. Here is the highest point, Mount Lamlam, 1,334 feet. The temperature varies but little from the annual average of 81°F. Rainfall averages 70 inches a year. Banana, coconut, breadfruit, and rubber trees are among the tropical growth of the lowlands. Taro, cassava, corn, and sweet potatoes are the main crops. Chickens, pigs, and cattle are raised. Water buffaloes are the chief work animals.

Apra Harbor, 3½ miles wide, is one of the world's great naval bases. On it is Piti, the port of foreign trade. Agana, the capital, is 5 miles northeast. Between them is the naval and commercial air base. An Air Force base is 8 miles northeast of Agana.

The natives are Chamorros. They are of Malay stock, but they have so intermarried with other peoples that there are few pure-blood Chamorros left.

Spaniards took possession of Guam in 1528. Missionaries arrived in 1668, financed by Maria Anna of Austria, for whom the Marianas are named. The United States cruiser *Charleston* captured Guam in June 1898, and Spain ceded it to the United States on Dec. 10, 1898 (*see* Spanish-American War). In 1899 Spain sold the rest of the Marianas to Germany. After the first World War Japan gained them under a mandate.

Guam became a United States naval station and was governed by the Navy. In 1903 an ocean-cable relay station was built at Sumay. Under Spanish rule the natives had declined from 50,000 to 10,000. Aided by the Navy's health program, the native population increased. Agricultural and trade schools were built. Guam was demilitarized in 1922 by the Washington treaty that limited naval armament (*see* Harding).

In 1941 Guam stood as the only break in Japan's island barrier that reached 3,000 miles to the equator. When the Japanese attacked, Guam fell. After a bitter campaign, American forces won it back in 1944. The Navy made Guam into a major naval-air base. In 1950 Congress gave Guam local self-government and the natives became American citizens. The Department of the Interior was made responsible for relations between Guam and the United States. (*See also* Pacific Ocean.) Population (1950 census), 59,498.

HOME *of the* OLDEST AMERICAN CIVILIZATION

GUATEMA'LA. The most populous country of Central America is also the most Indian. In fact, it is the most Indian of all the American nations. About two-thirds of Guatemala's inhabitants are pure-blooded Indians of the ancient Mayan stock. They are a country within a country. Living very much as their ancestors did before the Spanish conquest, they have successfully resisted for 400 years the white man's civilization. They labor on his coffee *fincas*, they build his ever-widening network of highways, but they do not speak his language or adopt his customs. Their beautiful tribal costumes are the symbol of their aloofness.

Most of the remaining third of the population are *ladinos*, of mixed Indian and white blood. A small percentage is Spanish, German, and Negro.



The church and the village market are the centers about which Indian life revolves. Here the people of the countryside sell their foodstuffs and homemade goods and buy the products of other localities. The picture shows the market of Sololá, which is typical of all. The folded cloths on the women's heads are their carrying cloths. Men's clothing is almost as colorful as the women's. The church in the background was built by the Franciscans in 1541.

Guatemala is the most northerly of the Central American republics. It stretches from the Atlantic to the Pacific, between Mexico on the north and northwest, and El Salvador and Honduras on the east. It is the third largest and potentially the richest of the Central American republics. It ranks first in foreign trade. Like its neighbors, it is a land of hot steaming coastal plains, volcano-tipped mountains, and high plateaus. (*See* Central America.)

Land of Eternal Spring

Most of the people live in the highlands (*los altos*) at heights of 3,000 to 8,000 feet. This is a land of eternal spring, with a mild sunny climate. The days are warm and nights cool. In the rainy season, May to November, there may be 40 or 50 inches of rain.

FACTS ABOUT GUATEMALA

Extent.—North to south, about 280 miles; east to west, about 260 miles. Area, 42,042 square miles. Population (1950 census), 2,788,122; at least 60 per cent pure Indian.
Physical Features.—Cordillera along Pacific coast; about 30 volcanoes (Tacaná, Acatenango, Tajumulco more than 13,000 feet). High valleys and plateaus, with parallel ranges striking eastward from highlands. Pacific and Caribbean coastal plains; plain of the Petén at base of Yucatán peninsula.
Exports.—Coffee and bananas (90 to 95 per cent of total value); chicle; gold; vegetable oils; hides.
Other Products.—Corn, beans, wheat, sugar cane, rice, cotton, livestock; mahogany, logwood, cedar, kapok; textiles, pottery, shoes, soap, flour, sugar.
Imports.—Cotton fabrics, foodstuffs, iron and steel manufactures, tools and machinery, railway and road materials.
Chief Cities (1950 census, preliminary).—Guatemala City (capital, 284,233); Quezaltenango (27,782); Puerto Barrios (15,659); Mazatenango, Antigua, Zacapa, Cobán (over 6,000).

The scenery is exquisitely beautiful. The snowy cones of volcanoes—some still active—look down on a countryside blazing with the bright colors of flowers and Indian costumes. Trails and roads twist skyward along breath-taking *barrancas*, or gorges, plunging hundreds of feet below. Here is one of the world's most beautiful lakes, Atitlán.

Here too is one of the world's most romantic cities, visited by every tourist. Antigua, once the richest and proudest city between Mexico and Peru, was the capital of the Spanish colony until it was destroyed by earthquake in 1773. Though the capital was removed to Guatemala City, many of the people remained in the ruined and partially rebuilt city. The Indians spread their wares on market days within the shattered walls and patios of the Jesuit church, monastery, and college. A native pottery works occupies the cloisters of Las Capuchinas, the first Catholic sisterhood in Central America. Coffee *fincas* (plantations) have grown up about others of the city's 80 churches and monasteries. Some lovely Moorish residences, the Palace of the Captains General, other public buildings, and the nave of the Cathedral have been restored.

Twenty-five miles from Antigua is the new capital, Guatemala City. A great modern city, it is the largest in Central America. It has been leveled by many earthquakes and repeatedly rebuilt, so that few old buildings remain.

There are no other large cities. About 125 miles west of Guatemala City, high in the mountains (7,600

feet) is Quezaltenango with 27 782 people This city was named for the national bird the quetzal (*see* Quetzal) The third largest city is Puerto Barrios a seaport on the Gulf of Honduras Next in size is Mazatenango in the southwest

IN SANTIAGO ATITLÁN



Very different from these modern cities are the Indian villages Most of the Indians live not in the village but in the hills and valleys about it So large a community as Sololá one of the chief trading centers has only 3 308 residents Chichicastenango the village most visited by tourists is little more than a large plaza and a few narrow streets (population 1 692) Yet it is the center of a municipality of 40 000 people

The Indians and How They Live

Every Indian village is a little world to itself Its people weave their own beautiful costumes which differ in every village They speak their own dialect They rarely marry *out of the village* In many villages the land is held in common In others each family owns enough *land to raise* its own corn and vegetables

In the great plaza before the *church* is held the weekly or semiweekly market Each village specializes in some product which its traders sell in the markets of its neighbors On market day hundreds of *traders* pour in All are on foot for they are too poor to own pack animals The wife trots along after her husband a baby slung in a cloth across her back a basket balanced on her head In the basket may be calla lilies a live turkey a pot of honey a pound of black beans whatever she may have to trade

In a large market one lane may be devoted to leather goods another to machine-made cotton goods. Here are hand woven blankets there are wild caged songbirds and water jars Open charcoal fires burn along the food lanes where the women are making *tortillas* (flat cakes of corn bread) and weighing grain vegetables and fruits on simple scales

When coffee-picking season comes the villages and their farms are deserted The government compels the Indians to work for wages at least a hundred days a year This provides labor to pick the vitally important coffee crop At the same time it protects the Indian from the evils of peonage He may no longer be held in semislavery to work out his debts to the *finca* owner (For more details about Indian life *see* Central America)

The Agriculture of the Highlands

Coffee is grown almost everywhere in the highlands By far the most important money crop it represents 60 to 65 per cent of the total value of exports Germans own a large share of the coffee lands and until the second World War they controlled the export trade



The thatch roofed mud walled house just back of the stone wall in the picture above is a typical highland Indian home Below the woman is weaving on a hand loom, the hood over the baby's head protects him from the Evil Eye

Corn is the staple of the native diet Every village has its corn field and many rituals are associated with planting and harvesting It is perhaps no coincidence that the predominating colors of the native costumes red yellow white and black are the colors of corn Mayan legend declares that the first four men created were made of corn paste and the Mayas *first* cultivated corn from the wild grass *teosinte*

Various other crops are grown on the rich volcanic soil. Above the coffee zone are wheat, barley, and potatoes. Below the coffee zone are black beans and other vegetables, cacao, sugar, rice, fruits, and cotton. Except bananas and sugar, these are all grown by primitive methods for home consumption On the lower slopes on the Pacific side are scattered cattle ranches.

A WOMAN OF ANTIGUA



This woman is selling strings of sweetmeats in the plaza of Antigua Like most Indians she is barefooted.

The Lowlands

Not all of Guatemala is included in the highlands. On the Pacific side, along the 200 miles of coast, is a plain about 50 miles wide. There is another small area of lowland along the 70 miles of Caribbean coast

In the stifling jungles of the Caribbean coast, exposed to the moist northeast trade winds, the natives say it "rains thirteen months of the year." Some places receive 200 inches of rain annually and the average is about 90. The temperature averages between 75° and 80° F. the year around.

The narrow Pacific coast, protected from the trade winds by the mountainous backbone, has a wet and a dry season. It is covered with grasslands, marshes, scrubby bushes, and deciduous forests.

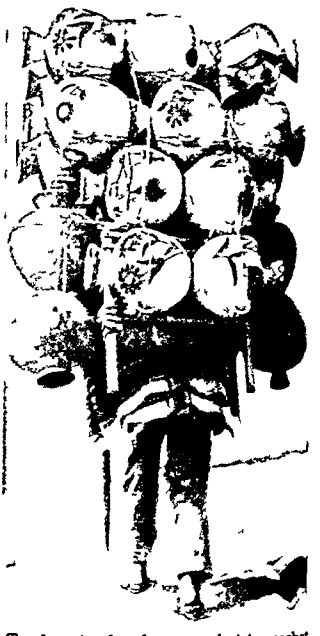
Thousands of square miles of jungle and scrub have been cleared on both coasts for banana plantations. Bananas account for 30 per cent of the annual exports, and Guatemala is second only to Honduras among the banana countries of Central America. The United Fruit Company controls the export trade and grows about 60 per cent of the export crop on its own lands. The plantations are worked by Negro labor. Indians cannot endure the hot, malarial coasts.

Besides the highlands and the coastal lowlands, there is a third great division, which makes up about a third of the area. This is the great empty Petén plain, which thrusts far northward like a wedge between Mexico and British Honduras. It is partly grassy lowland, partly jungle. In all its 14,000 square miles there is not a road or a navigable river. From the Petén and the neighboring regions in Mexico and British Honduras comes virtually all the world's supply of chicle, from which chewing gum is made (*see* Chewing Gum). The chicle is flown out by airplane.

Other Resources and Industries

Forests cover more than 2,000 square miles. In addition to chicle they contain valuable cabinet woods, dyewoods, and medicinal plants. These resources are little developed away from the coasts because of the lack of transportation. The *ceiba* tree is the source of *kapok* or "tree cotton." One United States company has planted several hundred thousand of these trees. Cinchona or quinine trees have been planted with the assistance of the United States Department of Agriculture

TRAVELING MERCHANT



Traders trudge from market to market carrying burdens of 80 or 100 pounds. This merchant is carrying a huge load of water jugs tied to a wooden carrying frame which is supported around the man's forehead with a tumpline

Although Guatemala has a great variety of minerals, the difficulty of transportation has discouraged their exploitation. Gold is found in some of the short, swift rivers, and is exported in small quantities Some chromite is exported; lead, salt, and sulphur are produced for home use.

DANCE OF THE CONQUISTADORS



This popular annual dance celebrates the Spanish conquest The masks represent Alvarado, whose red-gold hair won him the name Tonatiuh, "Child of the Sun."

There is little manufacturing. The Indians make nearly everything they use except knives (machetes), and the rest of the population has little buying power. The few textile mills import most of their raw materials. Other products are flour, sugar, soap, pottery, shoes and other leather goods, bricks and tile, and furniture. The United States usually supplies about

half of the imports and takes two-thirds of the exports

Many roads have been built in recent years, and most of the cities of importance can be reached by automobile Guatemala was the first country to complete its share of the Pan American Highway Air service is well developed Guatemala City is connected with both oceans by rail

Education and the Arts

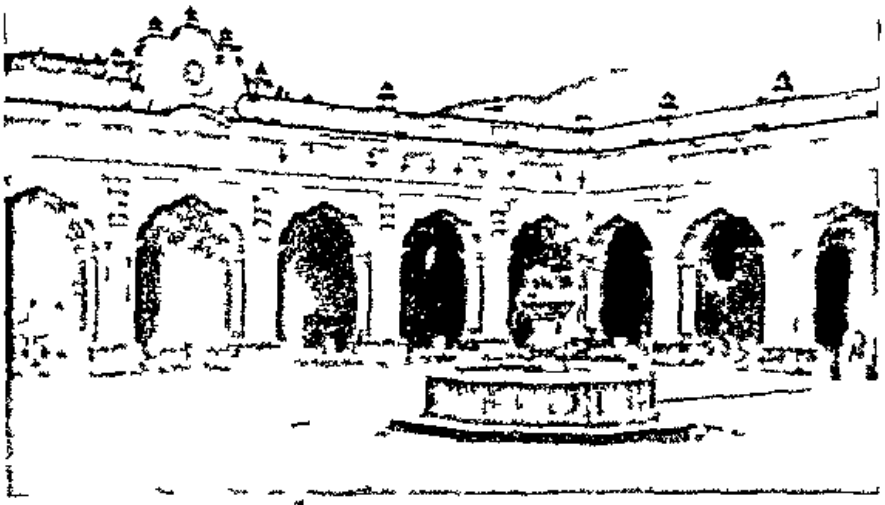
All children between 7 and 14 are supposed to attend school but the government has so far been unable to provide enough schools and teachers Only about one in five of the people can read and write In recent years there have been special efforts to set up rural schools and improve instruction But even in the cities many children of school age get no schooling Secondary schools exist only in the largest cities Guatemala City has a number of vocational schools and the National University, which includes several professional schools The National School of Law is in Quezaltenango In the Indian village of San Pedro Sacatepéquez is the Industrial School of Spinning and Weaving maintained by the government to keep alive the beautiful native textile arts

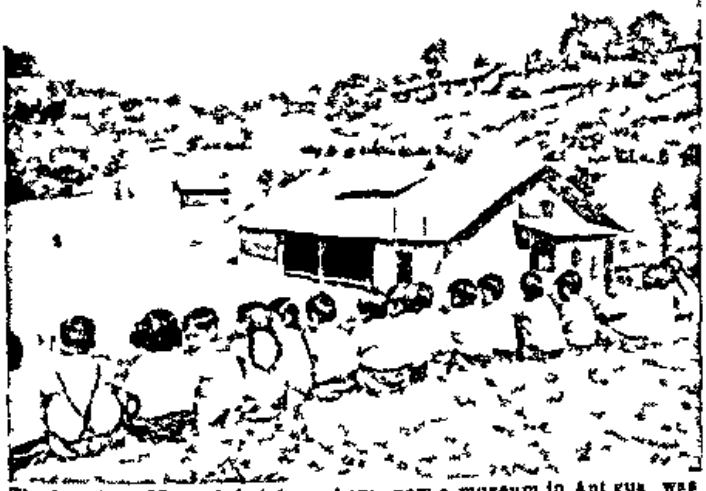
In literature Guatemala has produced several writers of distinction (*see* Latin American Literature) Its greatest painter is Carlos Merida Other artists are the painters Humberto Garavito and Alfredo Galvez Suarez the sculptor Yela Gunther and the puppeteer Tony Sarg

History and Government

Guatemala was the cradle of the Mayan civilization The civilization reached its height in the Petén plain and the neighboring Yucatán peninsula (*See also* Mayas Yucatán) The highland Mayan tribes were conquered and virtually enslaved by Pedro de Alvarado between 1502 and 1524 Under Spanish rule Antigua was the seat of government for all Central America When Guatemala won its freedom in 1821 it was for a time the leading state in the Federal Republic of Central America Since 1838 when the republic broke up into independent states Guatemala has been governed by a few long term dictators Rafael Carrera 1839–65 Justo Rufino Barrios 1871 85 Manuel Estrada Cabrera 1898–1920 and Jorge Ubico 1931–44. Although Ubico protected the Indians and put through the most progressive reform program in the country's history the people revolted against his ironhanded rule and forced him to resign in July 1944 Meanwhile the republic had declared war against the Axis in December 1941 and had given the United States air and naval bases The constitution of 1945 provides for a president and a National Assembly of one chamber elected by universal suffrage The Council of State has three members elected by the National Assembly and four appointed by the president Roman Catholicism is the prevailing religion, but all creeds are tolerated (*See also* Latin America.)

OLD ANTIGUA AND A MODERN COFFEE PLANTATION





The beautiful Moorish building above now a museum in Antigua was the University of San Carlos Borromeo which held its *first classes in* 1681 The University moved to Guatemala City after the earthquake of 1773 The children below live on a coffee *finca* As they do not wear the Indian dress they are probably *ladinos* or mixed white and Indian

GUAYULE (*gua-yo'lā* or *wī yo'la*) When war cut off the supply of rubber from Malaya and the East Indies early in 1942 the United States turned for part of its new supply to a dusty looking Mexican shrub the guayule Its roots and stems give the same *latex* which is obtained from rubber trees for manufacture into rubber Being a desert plant it could grow naturally from the Rio Grande to the Pacific coast If enough bushes could be planted and certain special problems could be solved here was a good source of rubber

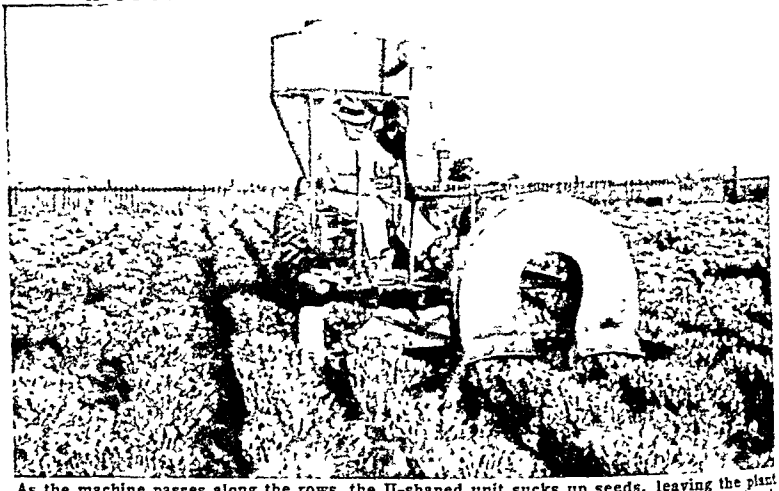
Experiments had been made with guayule in Mexico Texas and California since 1907 but the rubber had cost from 15 to 20 cents a pound and plantation rubber could be produced in the Orient for much less. This hampered development until the United States started intensive work under a bill signed March 5 1942 with an initial project to maintain 75 000 acres of plants in the Western Hemisphere In the first years of the war, about 32 000 acres of guayule were planted in the United States, mainly in California.

Production of rubber from guayule starts with uprooting the plants by machine. The plants are ground between rollers. The resulting meal is powdered, and the latex is floated off in settling tanks. Then it is treated to remove resin. The resin amounts to about one-fifth of its weight, or five times as much as in latex from rubber trees. The latex is dried under vacuum into rubber, and pressed into slabs.

By the time the first war crop of guayule was ripe, the United States was producing synthetic rubber. After taking about 3 million pounds of rubber from guayule in a difficult process, the government plowed under a huge acreage in 1946. But after the Communists increased in strength in Malaya, the United States in 1951 resowed guayule, in Texas, to be processed by a new method.

Guayule grows to about one yard high and a yard wide when fully mature. It may live for 50 years, storing rubber during dry seasons for ten years. The flowers are small white or yellow stars; the bladelike leaves are two inches long. The plant belongs to the aster family; scientific name, *Parthenium argentatum*.

A SUCTION MACHINE GATHERS GUAYULE SEED



As the machine passes along the rows, the U-shaped unit sucks up seeds, leaving the plant to grow. This economical procedure cannot be used if the guayule is sowed broadcast.

GUELFS (*gŵĕlfs*) AND GHIBELLINES (*gĭb'ĕ-lĭns*). The rivalries of these two great political parties long distracted Germany and Italy. "Welf" (which is "Guelf" in Italian) was the name of a ducal family which ruled Bavaria and Saxony in the Middle Ages. Its most noted member was Henry the Lion (1129–1195), who was deprived of his lands by the Hohenstaufen emperor Frederick I (Barbarossa). The rival battle cries of these two families—"Hi, Welf!" and "Hi, Waiblingen!" (the latter from a little village in Swabia near Castle Hohenstaufen)—became in Italy "Guelf" and "Ghibelline," respectively.

The Hohenstaufens stood for a strong monarchical government and for the imperial rule over Italy. The Guelfs stood for feudal opposition to the monarchy and for the independence of the Italian towns. The influence of the papacy was usually on the side of the Guelfs. After the fall of the Hohenstaufen emperors (1254), the larger issues between the two parties were lost sight of in petty feuds. By the 15th century the names Guelf and Ghibelline lingered only in Italy, where they came to mean little more than local factions marked by trivial practises such as wearing feathers in the cap, or making certain gestures in speaking.

The house of Welf (Guelf) continued to rule certain parts of Germany—Hanover and Brunswick—until late in the 19th century. With George I, in 1714, the Guelf (or Guelph) family came to the throne of Great Britain as the Hanoverian line.

GUIANA (*gī-ă'nă*). That little known part of South America which lies between the Orinoco River, the Amazon River and its tributary the Rio Negro, and the Atlantic Ocean, is known to geographers as Guiana. In common usage, however, Guiana means especially the three zones of British Guiana, Dutch Guiana, and French Guiana. The coast is everywhere low, hardly rising above high watermark. For 20 miles inland the land was once a mangrove swamp, but it was diked and drained by the early settlers and thus made into fertile plantations.

Along the shores and on the banks of the numerous rivers, where similar plantations have been formed, live the scanty population. Beyond the stretches of rich heavy loam brought down by the rivers, lie low ridges of sand and shells, showing where the coast line was in former ages. Farther inland the country rises into a rocky hilly plateau (3,000 to 4,000 feet above sea level), covered with primeval and almost impenetrable forests, except where grassy plains or *savannas* occur. The ranges of low mountains and hills which traverse this plateau are rich in gold, aluminum ore, and other minerals.

In the perpetual summer of the hot moist climate vegetation flourishes. The district is noted for the height and variety of its trees, many of which furnish valuable woods, and for the size of the leaves and flowers. Orchids sometimes grow in large masses with flower stems 12 feet high, and gigantic vines festoon the trees. In the lagoons and rivers grow many kinds of water lilies. The largest, the famous *Victoria regia* with leaves six or seven feet across, has been carried from British Guiana to many other parts of the world. Alligators and great fish of innumerable species abound in the rivers, and the forests are filled with richly plumaged birds, such as the scarlet ibis, white egret, and flamingo; with reptiles of many kinds; and with wild animals, such as the tapir, the sloth, and the ant-eater,

jaguar and monkey The insects are remarkable for their great variety and brilliance Flowering

The Guiana coast was first sighted on the third voyage of Columbus in 1498 During the 16th century Spaniards and Portuguese explored up its rivers in search of the fabled El Dorado Sir Walter Raleigh led an expedition to the Orinoco River in 1595 and again in 1617 (*see* Raleigh) By the middle of the 17th century British Dutch and French traders had founded several settlements



Guiana is divided among the British the Dutch and the French From the high forested plateau many rivers plunge to the narrow coastal plain Except for areas around coastal cities the land is covered with dense forests

British Guiana, the only British possession on the mainland of South America has an area of nearly 90 000 square miles and a population of 375 701 (1946 census) More than two thirds of the people are African Negroes and Asian Indians imported as mine and plantation workers South American Indians number about 18 000 There are smaller groups of European whites and Chinese *Principal exports go to the* United States Canada and the United Kingdom They include bauxite gold diamonds timber balata (a gum) sugar molasses rice rum and copra

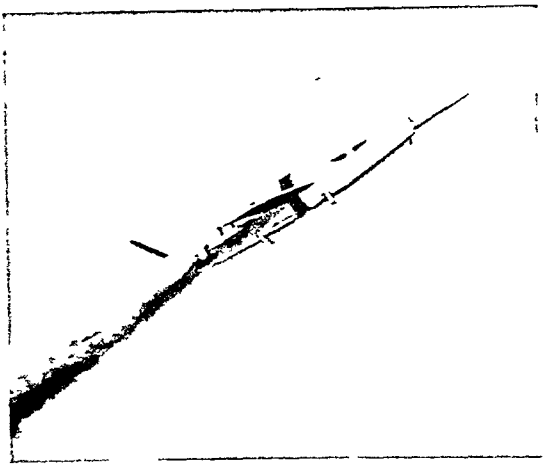
Transportation is largely by river and air for the rugged interior discourages the *building of railways* and roads and heavy rains make them hard to maintain There are about 450 miles of navigable rivers but hardly 100 miles of railways *Passengers and mail* are flown between Georgetown the capital and Miami Fla Georgetown is below high tide mark and is drained by canals and pumps *Its houses are built* on piles In the interior rivers plunge from the plateau and form vast falls such as Kaieteur Falls on the Potaro River (for picture *see South America)* Also notable are Marina Fall on the Ipobe and the falls of Mount Roraima which drop *1 500 feet*

In the destroyers for-bases transaction between the United States and Great Britain in 1940 air and naval bases were acquired near *Georgetown (see* World War Second) Leased for 99 years they could be used again in an emergency

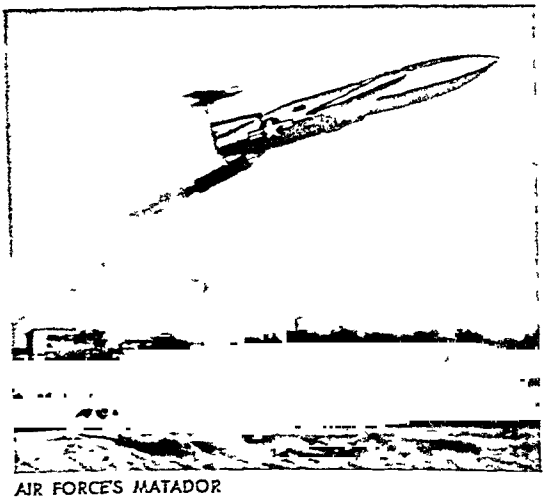
Population expansion has far outdistanced industrial growth Unemployment and political strife are the colony's most pressing problems Increasing postwar unemployment contributed to a large extent to the rise to power of the pro-Communist Peoples Progressive party led by Dr Cheddi Jagan In October 1953 the governor was forced to depose Jagan's government and suspend the new constitution Troops were sent from the United Kingdom to maintain order

Surinam (Dutch Guiana) was ceded by the British to the Dutch in 1667 in return for the surrender of the Dutch claim on New Amsterdam now New York About 54 300 square miles in area Surinam has 214 000 inhabitants (*1949* est) About one third live in Paramaribo the capital Most are mine and plan*tation workers* chiefly Hindus Javanese Chinese and Negroes In the interior are 22 000 bush Negroes descendants of escaped slaves There are about 2 000 whites To protect the bauxite deposits which supply the United States with a major part of its aluminum ore imports United States troops occupied the colony in 1941 Other exports are sugar rum *coffee and gold*

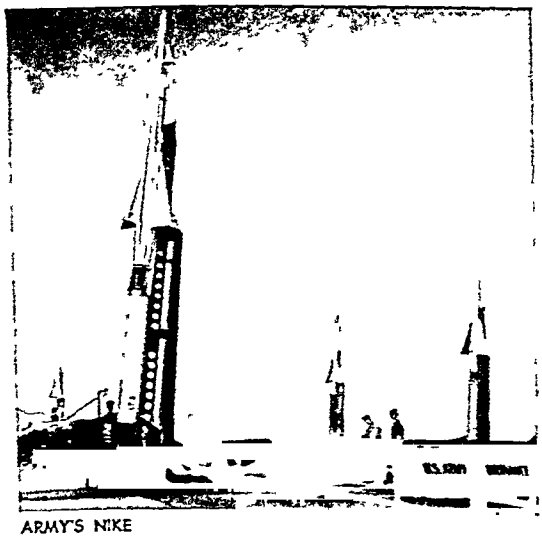
Guiana (French Guiana) with its 34 750 square miles has 26 854 inhabitants (1946 census) It became noted for its penal colony established in 1852 France sent unruly French convicts to prisons on three tiny islands One Devil's Island became famous as the prison of Capt Alfred Dreyfus the victim of a French army plot in 1894–99 After release many convicts were stranded in Guiana With their descendants they formed much of the white population Abolition of the penal colonies was started in 1946 and completed in 1953 The free settlers include Negroes and Indo-Chinese Most of them are mine plantation or road laborers About 3 000 South American Indians live in the jungles Cayenne on the island of Cayenne is the capital and seaport The few exports include gold sugar coffee cacao and timber Only a few thousand acres are under cultivation To further develop the resources of the interior France in 1930 set it up as a separate colony But in 1946 all French Guiana became an Overseas Department in the French Union (*see* France)



NAVY'S REGULUS



AIR FORCE'S MATADOR



ARMY'S NIKE

Modern SPEARHEADS *for* WAR *and* SCIENCE

GUIDED MISSILES. World War II brought, along with radar and atomic energy, an almost entirely new family of weapons collectively called *guided missiles*. It is jokingly said that these missiles have upset not only the art of warfare but even the time-honored sequence of orders. For guns the orders are: "Ready! Aim! Fire!"—for missiles: "Ready! Fire! Aim!" This is not quite true, however, for even guided missiles are aimed before firing; but one of their distinguishing characteristics is that the firing crew can continue to aim after firing. The other outstanding characteristic is that a missile is not fired from a gun but is "fired" only in the sense of being ignited, after which it goes on its own way under its own propulsion system. Only a weapon which has both these characteristics is a guided missile. Bombardment rockets, for example, although they proceed under their own power, are not guided missiles because their path (trajectory) cannot be controlled after firing.

Early History

Experimentation with naval torpedoes began about a century ago and many types were created in the latter part of the 19th century (*see* Torpedoes and Mines). Some of these were electrically propelled, both by means of built-in batteries and through trailing wires. Others ran on compressed air supplied through trailing hoses. One type held two reels of piano wire geared to two propellers. A shore-based steam engine pulled the wires, and the harder the engine pulled the faster the torpedo moved away from the shore.

Many torpedoes were suspended from floats to aid the launching crew in guiding the torpedo to its target. All these torpedoes were meant for harbor defense from shore installations; however, none ever saw service. Only the Whitehead torpedo survived and it was self-powered but unguided. Efforts to produce a guided torpedo were fruitless.

American Developments

The first attempts to create an airborne counterpart of the naval torpedo took place in the United States during World War I. A pilotless plane was to be guided to a target and crashed into it in a power

dive exploding its charge In 1916–17 a prototype called the Hewitt-Sperry Automatic Airplane made a number of short test flights proving that the idea was sound In November 1917 Army representatives witnessed one of these flights and started a similar aerial torpedo or flying bomb project led by Lieut Col Bion J Arnold for the Air Service and Charles Kettering for industry The latter was assisted by Orville Wright and C H Wills of the Ford Motor Company Various companies working together produced 20 complete pilotless aircraft (called Bugs) and a successful test flight was made Oct 4 1918 Since World War I ended five weeks later all projects were discontinued except for some experiments with Bugs This project was dropped in 1925 for lack of funds

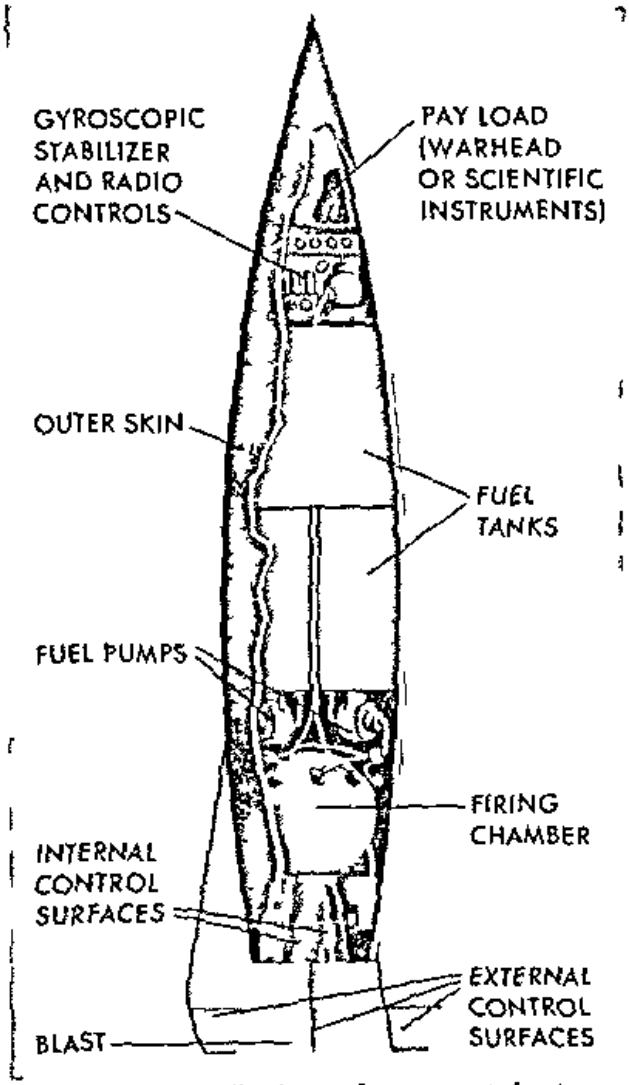
The Navy's Bureau of Ordnance decided to follow up one aspect of the overall problem of the aerial torpedo and to develop a radio controlled plane An N 9 trainer seaplane was used as the basic vehicle and rebuilt with stabilization and radio control equipment developed by the Naval Research Laboratory and by Carl Norden A successful flight without a pilot aboard took place Sept 15 1924 but the plane was damaged in landing and sank Thus ended the career of the first of the drones as pilotless planes not used for combat are now called

During the next decade there was little missile research but developments in electronics and progress in aviation produced results which were later applied to missiles In 1936 the Navy began another drone program which was intended to provide realistic targets for antiaircraft gunnery practice but which directly influenced missile development Lieutenant Commander (later Rear Adm) D S Fahrney was in charge of the project The plane used was a Stearman Hammond JH 1 and the radio control equipment was again developed by the Naval Research Laboratory This drone made its first successful flight Nov 15 1937 The following summer such a drone was first used for target practice by the antiaircraft batteries of the U S S *Ranger* Commander Fahrney then suggested the development of assault drones

In January 1941 work began on the conversion of a TG 2 (torpedo plane) and a BG-1 (dive bomber) into missiles The converted and pilotless torpedo plane flown by a pilot in a plane ten miles away successfully attacked a destroyer on March 23 1942 The converted dive bomber was crashed into a raft towed by a tug in Chesapeake Bay on April 19 1942 The controlling pilot who flew the drone by television was 11 miles distant at the time These tests proved that assault drones were practical and various planes were converted and used in World War II

Since a plane can carry a larger load in a glider than it can carry directly the next plan was to build a glider bomb to be towed into the combat area and guided into the target just as the assault drones were guided Several such developments were started among them a glide bomb with a radar homing device Called the Bat it saw action in the Pacific Other

PARTS OF A GUIDED MISSILE



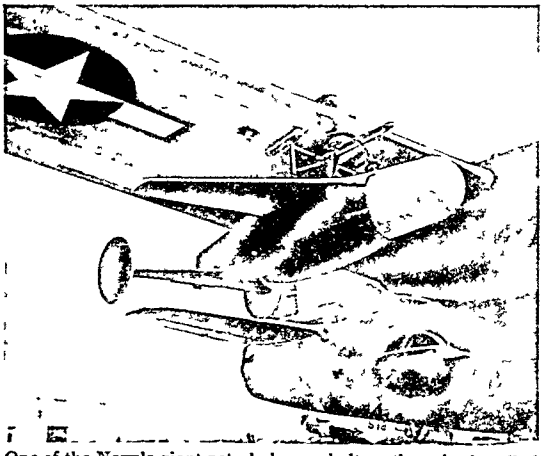
This diagram suggests the shape and arrangement of parts in a type of guided missile Details of the guidance systems of most modern missiles are closely guarded military secrets

missiles were the BC 1 and BG-4 glide bombs the latter television equipped which were used in Europe Four other missiles were developed in the United States Little Joe an antiaircraft missile propelled by solid fuel rockets and three types of Gorgon with pulse jet engine turbojet engine and liquid fuel rocket motor respectively

German Developments

In 1932 the German army having devoted a small amount of money and time to research on rocket weapons became interested in liquid fuel rockets A few years later the army and air force set up a joint research center which because it was near the village of Peenemünde on Usedom Island in the Baltic was usually called the Peenemünde Research Institute Of the large number of different missiles developed and tested there in 1938–44 only two were produced and used in the last year of World War II They are now known as V 1 and V 2 V stood for *Vergeltungswaffe* (vengeance weapon) because the missiles

A BAT NESTLES UNDER A PRIVATEER'S WING



One of the Navy's giant patrol planes shelters the missile called the Bat. Privateers carry a Bat under each wing. They were used to attack Japanese shipping during World War II.

were used to retaliate for the Allied air raids on Germany. During development, however, they had different names. The V-1 was first called Fieseler 103, or Fi-103. It also had the code name *Kirschkern* (cherry pit). The soldiers who launched it called it *Krähe* (crow). The V-2, during development and even later, was designated A-4 (A for "aggregate," a term used for devices consisting of a number of subassemblies).

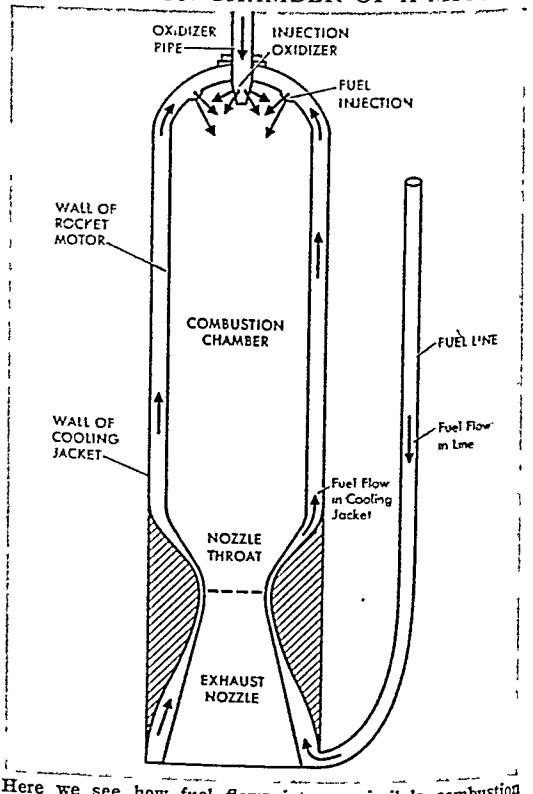
The fact that a formerly lonely Baltic island was teeming with activity was not overlooked by British Intelligence. The Royal Air Force flew over almost on schedule to take photographs. One day an R.A.F. pilot returned with a photograph of Peenemünde which showed something like a small plane on a launching ramp. It was an early V-1. Danish fishermen confirmed the suspicion that Peenemunde was an important military target. On the night of Aug. 17, 1943, the R.A.F. sent 300 bombers to destroy the research center. The raid destroyed some of the workshops and devastated the housing area. Work was halted for weeks. The main test stand was not hit. It was later bombed by American planes. But the great raid was too late. Both the flying bomb V-1 and the long range rocket V-2 were being produced.

The V-1 looked like an airplane. It had a fuselage 25.4 feet long and a wing span of 17.7 feet. Its warhead held 2,200 pounds of high explosive. Behind the warhead the fuselage held two wire-bound spherical pressure tanks containing compressed air to operate the vanes. Then came the fuel tank, which held enough 80-octane gasoline for 20 minutes of flight. The aftersection of the fuselage housed an automatic pilot which held the V-1 on course and at the set altitude, usually 2,000 feet. The propulsion unit was mounted on top of the fuselage. It was a jet engine of a type now called a pulse jet and was simple and cheap to produce; but it did not, like the turbojet, produce a steady exhaust blast. Its exhaust was intermittent, causing vibrations of the whole structure. It did not work well when at rest, for in order to operate properly it had to move at a fairly high speed. Therefore the V-1 was launched from a ramp by means of a catapult. Its usual range was 150 miles (longest observed range, 175 miles) and the flying speed about 350 miles per hour—slightly faster than the fighter aircraft then in use.

The first V-1 crossed the English Channel in June 1944. It carried a mechanism to shut off the fuel flow at a certain moment and put it into a dive that would crash it into the ground. Occasionally this mechanism failed to function, and the V-1, with motor silent, would go into a glide and land without exploding the warhead. Thus the Allies learned how the V-1 worked.

All V-1's were aimed at London, except one incompleted group intended for Bristol. The total number fired at London was 8,070—1,847 were shot down by planes, 1,878 by antiaircraft guns and rockets, 232 were stopped by barrage balloons, and more than 1,000 missed the city. London was hit by 2,420 V-1's, killing 5,684 persons, wounding 17,197 badly and 23,174 slightly; 24,491 dwellings were destroyed and 52,293 made uninhabitable. Even after the launching sites were captured an occasional V-1 hit London, carried within striking range by a German plane.

COMBUSTION CHAMBER OF A MISSILE

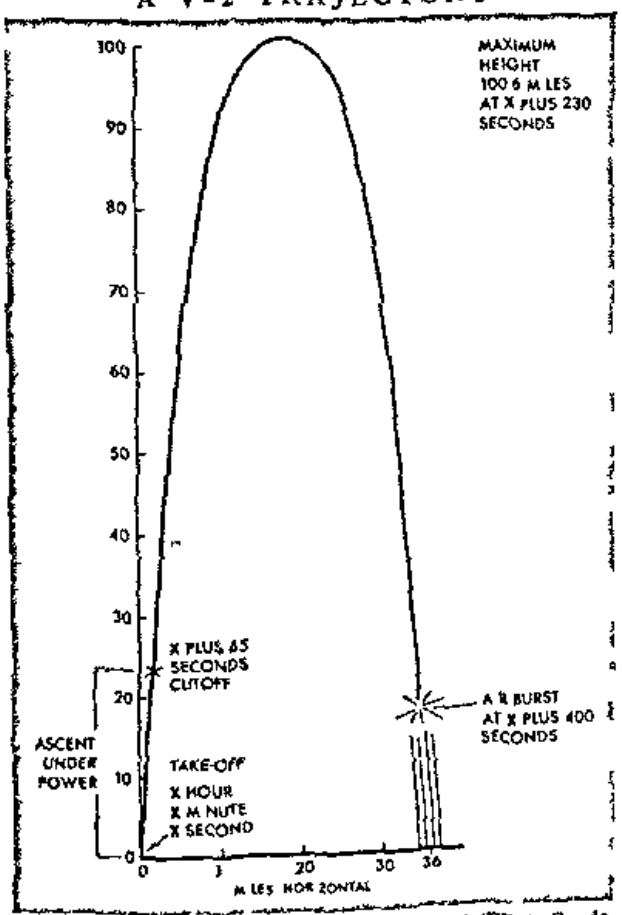


Here we see how fuel flows into a missile's combustion chamber. It is forced through a cooling jacket before entering the chamber to compensate for the terrific heat that is generated.

The V 2 saw action later than the V-1 and had a longer range—about 190 miles It did not need a launching ramp but was fired from a table easily carried on a truck The rocket was almost 47 feet tall and had a take-off weight of slightly over 12 tons The warhead filled with the high explosive amatol weighed one ton the rocket structure itself weighed three tons, and the fuel consisting of grain alcohol (including 25 per cent water) and liquid oxygen weighed eight tons

The V-2 s nose was the warhead The compartment housing the controlling instruments came next The alcohol tank followed an l then the glass wool in sulated oxygen tank with the alcohol pipe leading downward through its center Below the oxygen tank was what the British call the power bay ' housing the propulsion equipment It held the rocket motor and equipment for forcing the two liquids into it This was done by two centrifugal pumps driven by a steam turbine receiving its heat from a steam generator—essentially a pressure container into which potassium permanganate and high strength hydrogen peroxide (85 per cent hydrogen peroxide and 15 per cent water) were sprayed Reacting to the permanganate the peroxide (H_2O_2) decomposed into water and free oxygen, releasing so much heat that not only the water formed by the decomposition but also the water present as an "impurity" were turned into steam.

A V-2 TRAJECTORY



This diagram shows the trajectory of V 2 No 21 (White Sands March 7 1947) The trajectory is part of an ellipse with one focal point coinciding with earth s center (it is *not a parabola*)

The alcohol was not forced directly into the motor but entered a cooling jacket first for no metal could stand the heat developed in a rocket motor Actually there is no need for such a metal Ordinary mild steel works well when cooled, and in a rocket motor the fuel does the cooling

For warfare the V-2 s were grouped in ' batteries" making a road convoy Each of three special vehicles (*Meiler-waggons*) carried a rocket one truck carried alcohol and another oxygen There were also trucks for the firing crews and staff cars so that one battery consisted of about ten vehicles On reaching the firing site the tables were placed on the ground These were circular steel rings about five feet from the ground Each ring rested horizontally on four adjustable legs A rocket stood vertically on each table A steel pyramid between the legs of the table hollow and filled with water, was used to part the rocket s blast It was called the blast deflector The rockets were then placed on the tables and fueled An ordinary fireworks pin wheel was inserted into the exhaust nozzle as the ignition device

With the order Fire! the pin wheel was electrically ignited Then the fuel valves were opened so that the fuel could flow from the tanks into the motor This was called the preliminary stage and served to check the proper burning of the motor The thrust generated during this stage was about seven tons not sufficient to lift the 12-ton rocket When the firing officer saw that the motor burned properly he switched the fuel pump assembly into action Within three seconds the pumps ran at full speed, forcing the fuels into the rocket at the rate of 275 pounds per second The thrust jumped from 7 to 27 tons and the rocket, balancing on its fiery exhaust, rose slowly into the air In the first second, it traveled hardly its own length but accelerated steadily Four trim tabs in the stabilizing fins and four graphite rudders in the blast itself balanced the rocket to keep it on a vertical course for several miles Then the guiding mechanism operating the graphite rudders slowly tilted the rocket s nose in the direction of the target After 52 seconds the rocket moved upward at an angle of a little more than 45 degrees, still accelerating For another 13 or 14 seconds it continued on this tilted path under power, then the motor was shut off At that instant the rocket was about 20 miles high, about 20 miles from its take-off point and moving one mile per second It then traveled like an artillery projectile on momentum only, to crash into the target area 340 seconds after take-off Since it moved about 2¼ times as fast as sound, its coming could not be heard, but occasionally people near the impact point saw one

The first V-2 took off from Peenemunde early in 1942 The first one aimed at London was fired from the Netherlands on Sept 8 1944 The bombardment ended on March 27, 1945 when the 1 115th rocket fell in Kent The Germans had fired more than 1,400

rockets. Several hundred fell short or did not function properly. The total toll of the V-2 assault was 2,511 killed and 5,869 seriously wounded in London; and 213 killed and 598 seriously wounded elsewhere in England. Both the V-1's and V-2's were later used by the Germans on the European continent.

Germany also developed a number of glide bomb missiles. They were usually called Henschel, or Hs, missiles after their manufacturer and were used mostly against Allied convoys. Usually these missiles had a solid fuel rocket attachment to increase their diving speed. They were all radio controlled.

Research Missiles

At the end of World War II American troops captured the underground factory in the Harz Mountains where the V-2's had been manufactured. Three hundred railroad carloads of V-2 parts were shipped to the United States. Some of the German engineers who had developed the V-2 volunteered to come to America and to continue rocket research in the United States.

The next step in the story of the big rockets was known in the United States as the "V-2 program." The parts shipped from Germany made about 25 complete rockets. More than 50 others were almost completed with the exception of parts which could be manufactured. These rockets were fired from the newly established White Sands Proving Ground in New Mexico. The Army Ordnance Department trained American soldiers to handle and fire large missiles. Various scientific institutions supplied instruments to be carried by the rockets into the upper atmosphere. The operation was co-ordinated by a special V-2 panel of the Naval Research Laboratory.

After some failures the White Sands rockets soon reached heights of more than 100 miles—the record in the V-2 program was 114 miles; although later a lightened V-2 climbed to 128 miles. The scientific instruments were hooked up with an automatic radio transmitter and data was recorded on the ground while the rocket was in flight. Since it was not necessary to recover the instruments, the rocket was left to crash in the desert.

When cameras were carried, however, the film had to be recovered; but the rockets struck the ground with such force that nothing could stand the impact. The solution consisted in putting some four pounds of TNT under the instrument-filled warhead and exploding this charge by radio from the ground when the rocket, on the downward leg of its journey, had reached the 100,000-foot level. After the "air burst," as it was termed, the warhead fell freely to the ground. The rocket, with a gaping hole in front and the heaviest remaining piece of equipment, the motor, in back between the stabilizing fins, immediately became extremely unstable. It could not fall nose down or even tail down; it fluttered tumbling to the ground and often hit the desert flat. It could not be reused, but the impact was comparatively gentle and film in a well-protected camera was safe. On occasion some instruments were released on the way down with their own parachutes. To equip the whole rocket with a parachute was impossible. Large parachutes are too bulky to carry.

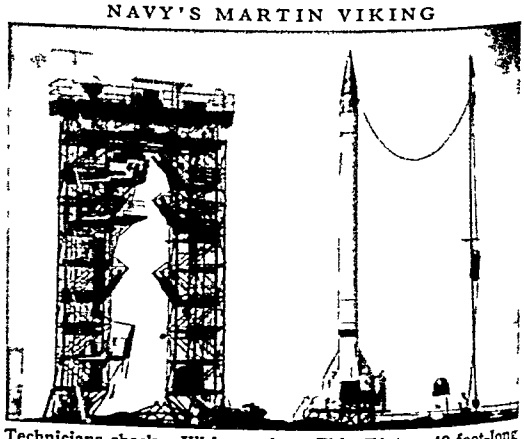
The V-2's, however, were not the only rockets to rise from White Sands. The first rocket to take off was an American model called the Wac Corporal. It was about 11 feet tall and reached a height of 35 miles As the supply of V-2's grew smaller other rockets were developed. One of them, the Navy's Viking, is as tall as the V-2 but slimmer and lighter. It has gone as high as 135 miles. The Aerobee is another small rocket about the dimensions of the Wac Corporal. It too is fired with a solid fuel booster to provide initial speed. The Aerobee can go up 75 miles. Simple and reliable, it is probably the most useful research missile in use today.

An important experiment was made on Feb. 24, 1949, when the first rocket of Project Bumper took to the air. It was a modified V-2 carrying a Wac Corporal instead of a warhead. As the V-2 neared exhaustion of its fuel, 20 miles up and going at the rate of a mile a second, the Wac Corporal, with full fuel tanks, was ignited. It lifted out of the V-2, adding its own half mile per second to the velocity it already had, thus obtaining a maximum velocity of one and a half miles per second. *This was enough to make it coast to a peak altitude of 250 miles into the thin layers of the upper atmosphere* (*see* Atmosphere). From the point of view of the engineer this experiment was important because it proved that the separation of rockets in flight could be accomplished.

Types of Missiles

Modern missiles are classified in various ways—some by propulsion system into rocket-propelled missiles, others as ramjet-propelled missiles, and so on Military men prefer classification by purpose in the following categories: SAM (surface-to-air, or anti-aircraft), AAM (air-to-air for combat between aircraft), STS (ship-to-shore), SSM (surface-to-surface, such as the V-2), ATS (air-to-ship), ASM (air-to-surface), AUM (air-to-underwater), and others. There

NAVY'S MARTIN VIKING



Technicians check a Viking rocket. This 5½-ton, 40-foot-long missile climbed to 135 miles in 1951. To the left is the gantry, or work platform, used to prepare the Viking for launching

NAVY'S LOON IS LAUNCHED FROM THE U S S CARBONARO



The Loon seen taking off from the deck of the submarine *Carbonaro* is a jet-propelled pilotless aircraft with internal controls. Its course and altitude are set in advance and an automatic pilot takes over after the missile is launched

are also the classifications air launched and surface launched missiles. That these classifications are more satisfactory for military than for other purposes is shown by the fact that both the V 1 and V 2 different as they are are SSM missiles.

This fact is the clue to a simple classification system. All missiles can be divided into two large groups of which the V 1 and V 2 are examples. The V 1 relied on wings to become airborne. As it moved from ramp to target it followed a flight path as a plane does. Hence we get the major group of the aerodynamically supported or flight-path missiles also called cruising missiles. More recent examples are the Navy's Loon (evolved out of V 1) and Regulus and the Air Force's Matador. All these can take off from a short launching ramp and no longer rely on a catapult but are equipped with rocket take-off boosters which later drop off.

Cruising missiles can be powered by any engine *except* a rocket motor. They are comparatively cheap (the price of one V 2 bought 20 V 1's) but they can be shot down. In the last phase of the V 1 attack on London three out of every four missiles were successfully intercepted. The engines of cruising missiles are air breathing like those of planes and they cannot climb out of range of fighter aircraft.

The missiles of the second group are characteristically wingless and not supported by air. Thus they follow a trajectory rather than a flight path and are called trajectory missiles. They are more difficult to build than cruising missiles. They are also far more expensive but due to their enormous speed and present ability to move at high altitudes are almost impossible to intercept. Barring mechanical failure all trajectory missiles fired should reach their target. Trajectory missiles are rocket powered because the air along their trajectory becomes too thin to provide oxygen for an air-breathing engine.

Guidance systems for missiles are military secrets but a few principles can be explained. A long range cruising missile can be guided by radio but if it skims too close to the ground (to avoid interception) the guiding engineer would as a rule have to be airborne. One method of guiding a cruising missile is to equip it with a television camera. The engineer can then see on a screen what he would see if he were in the missile. Thus he can fly it by remote control. This was done by the United States Navy in Korea. Future cruising missiles may be self navigating. A missile might fly at night with a robot pilot navigating by the stars as a human pilot would.

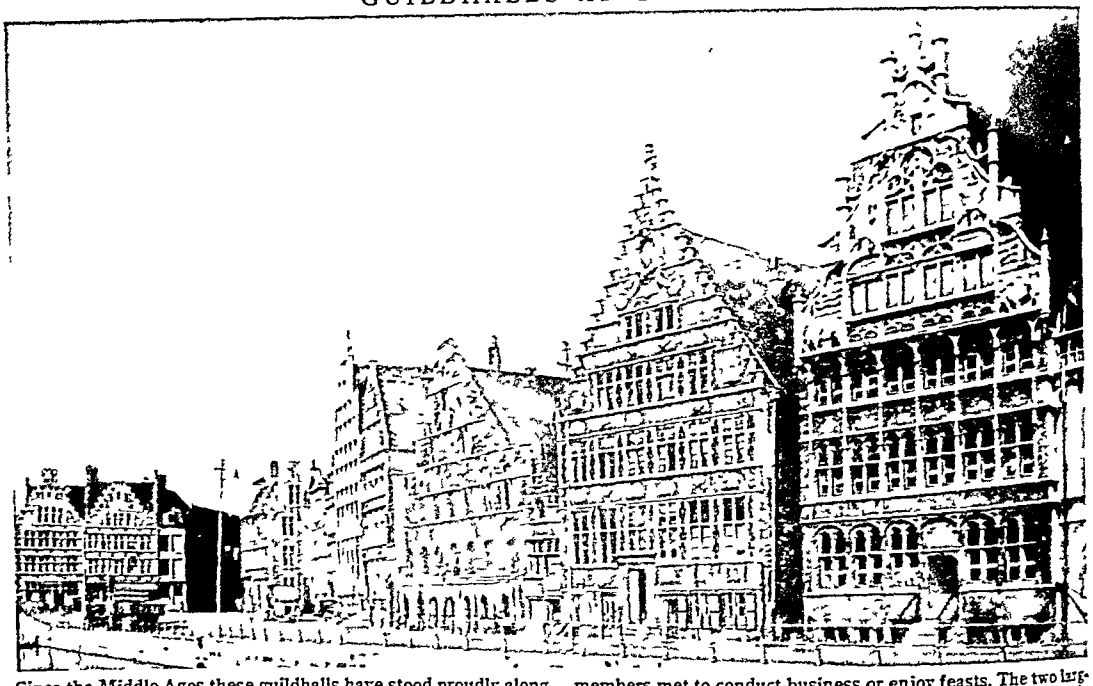
Trajectory missiles in little danger of interception require a minimum of guidance from ground or air. They might be made to respond to a radio target marker dropped by a plane. The missile would orient itself to hit such a target.

Maximum guidance is needed for SAM missiles. There are three possible systems. One is to select the target a bomber with a radar beam and then give electronic orders to the missile through another beam which trails it (the two-beam system). Method two (the one beam system) uses a missile called a beam rider which is thrown into the radar beam that trails the target. The mechanism of the built-in guidance system is such that a rocket straying from a beam would return into it. This is sometimes called conscience guiding for the mechanism like a conscience keeps the missile on the narrow path of the beam. Several missiles can be fed into the same beam in quick succession. The third system is called homing. The missile is fired in the general direction of the target. It carries a device which responds to something for instance the heat of the target's engine or its noise. This device will make the missile follow the source of the heat or noise until it hits the target. A homing missile could be safely used only if no friendly aircraft were in the sky.

Little information has been released about more recent missiles except for the Nike (Greek for victory). It forms part of the defense of our cities. The Nike is a true rocket and is helped along early in its trajectory by a solid fuel booster rocket.

Missile building is still in its early stages. Programs of research and development are being carried on in other nations as well as in the United States. For security reasons there is little information available about many developments. (For bibliography *see* Space Travel.)

GUILDHALLS AT GHENT



Since the Middle Ages these guildhalls have stood proudly along the Lys River in the old city of Ghent, Belgium. Here guild members met to conduct business or enjoy feasts. The two largest, at the right, are the Staple House and the Masons' Guildhall.

GUILDS. In every important town in Europe during the Middle Ages, men of each trade were members of associations called *craft* guilds. The guilds regulated their occupations and preserved a monopoly. The weavers were probably the first to organize. Soon after, the goldsmiths, saddlers, fishmongers, bakers, dyers, glovemakers, and many other trades, some with only a few workers, formed separate fraternities. In Paris, London, and other large cities there were as many as 50 or more guilds by the 14th century. Usually they were authorized by the local governments, but sometimes they obtained their charter from the king.

Guild Rules and Regulations

The guild rules provided that nonmembers could not practice the trade within the town. In some places a worker could become a member as soon as he showed the required degree of skill. In other places membership was hard to obtain. It went only to sons or sons-in-law of members or could be purchased only at a high price.

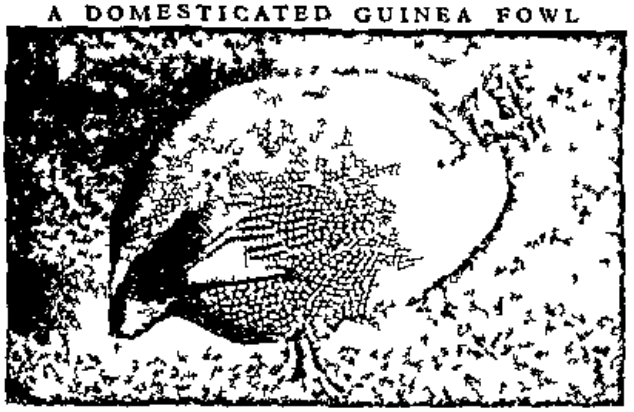
The guilds required standards of quality in articles made and sold by their members, and penalties were invoked for inferior merchandise. For example, the weavers' guild required a certain number of threads to the inch in standard cloths. Hours of labor were regulated and work at night and on holidays was prohibited. In later times, the insistence on obsolete standards and processes handicapped industrial development. This led to a shifting of manufactures to villages and to new towns where guilds were not established.

Other rules provided for mutual help, care of sick or needy members and members' widows and orphans. Once a year or more often the members gathered for a feast. In summer, usually on Corpus Christi day, they staged one of the miracle plays popular at the time (*see* Miracle Plays). Since the members of a craft usually lived on the same street, the guild was also a center of social interest for its members.

A young man qualified himself for membership in the guild by passing through an apprenticeship. As a boy he was *bound out* by his parents to an employer for a number of years, usually seven. The master fed, clothed, and lodged him with his family above or behind the shop. When the seven years were up, he was free to become a *journeyman* (from the French word *journee*, meaning a "day's work") and work for daily wages. Often he traveled from town to town seeking more knowledge of his craft. If he saved his money, he might start a small shop and be accepted for guild membership and privileges.

In addition to the craft guilds, there were powerful organizations called *merchant* guilds. Members of these guilds made a business of buying and selling and engaged in wholesale trade with distant places. The wealth and influence of one such group of merchant guilds provided the foundation for the powerful Hanseatic League that dominated the Baltic cities for centuries (*see* Hanseatic League). The merchant guilds had great influence in city governments, and their guildhalls were impressive buildings. Many of them still stand today. Some European cities had guilds for charitable and religious purposes.

A DOMESTICATED GUINEA FOWL



The American guinea fowl is fatter and slower than its lean and long legged African cousin

GUINEA (*gĭn'ĭ*) FOWL Many kinds of wild guinea fowl are found in Africa The birds derive their name from a section of the west coast of Africa They have been domesticated since the days of ancient Greece The common domestic guinea fowl of North America (*Numida meleagris*) introduced by the early settlers is descended from one of the wild African species There are three varieties—pearl white and lavender

Domestic birds cling to their wild habits and are hard to raise for this reason They hide their nests and the hen may refuse to incubate the eggs if the nest is disturbed They prefer to roost in trees and are difficult to confine in a poultry yard However they destroy many insects about the farmyard and are useful in protecting other poultry They are fighters and the loud one syllable shriek of the male gives warning of intruders The *female has a call* that sounds like buck wheat buck wheat The dark gamy flesh of the guinea fowl is considered a delicacy and finds a good market in restaurants and hotels The birds weigh 3 to 3½ pounds at maturity

Wild guinea fowls are of three kinds—those with a crest of feathers on the head those with a bony helmet and a bare head and those with a patch of feathers on the back of the head The domestic form is derived from the helmeted kind Some of this kind live in Madagascar also

GUINEA PIG This restless grumbling little rodent is curously misnamed for it is little *sense a pig and* is not native to Guinea but *to the Andean highlands* of Peru and other parts of South America Its real

THE USEFUL GUINEA PIG



The guinea pig is an important laboratory animal, used in the preparation of serums and antitoxins and in physiological experiments It breeds rapidly and is cared for easily

name is the *cavy* and it is related to the hares and rabbits It was domesticated in Europe in the 16th century and is frequently seen in the United States The cavy is about six inches long and exists in several varieties some of which have short hair and others long curiously ruffled hair The colors are varied usually black and white tan and white or a mixture of all three The animals are gentle and amusing and are bred as pets for children They are also in great demand as subjects for experiment in medical laboratories They live wholly on vegetable food and while feeding generally sit on their hind feet When free *they live in burrows and feed at dusk and on dark* days The guinea pig breeds rapidly and is capable of bearing young when but a few months old The scientific name of the guinea pig is *Cavia porcellus*

GUITAR (*gĭ-tär'*) A stringed musical instrument, the guitar resembles the lute It is much used as an accompaniment to the voice in singing especially in Italy and Spain It was introduced into Spain by the Moors It has six strings played by the fingers of the right hand while those of the left control the pitch by pressing on the fingerboard which has frets (metal strips dividing it into notes) across it The three highest strings are usually of gut the three lowest of silk spun over with silvered wire

GULF OF MEXICO This great indentation of the Atlantic Ocean more than 600 000 square miles in area is almost completely surrounded by the United States and Mexico In the 450 mile stretch between Yucatán and Florida part of Cuba interposes The only passages to the open sea are the Straits of Yucatán 120 miles wide and the Straits of Florida *varying from 60 to 100 miles wide From east to* west the Gulf measures 1 100 miles and from north to south 800 miles

Most of the 3 000 mile coast is low and marshy and is outlined for much of its length by barren sand bars sometimes 100 miles long with salt lagoons behind them The only islands in the Gulf are a few small ones off the Yucatán coast and the luxuriant Florida Keys The rivers emptying into it bring down a great amount of sediment Except for the Mississippi all of them are blocked by great bars which make them accessible only to vessels of shallow draft

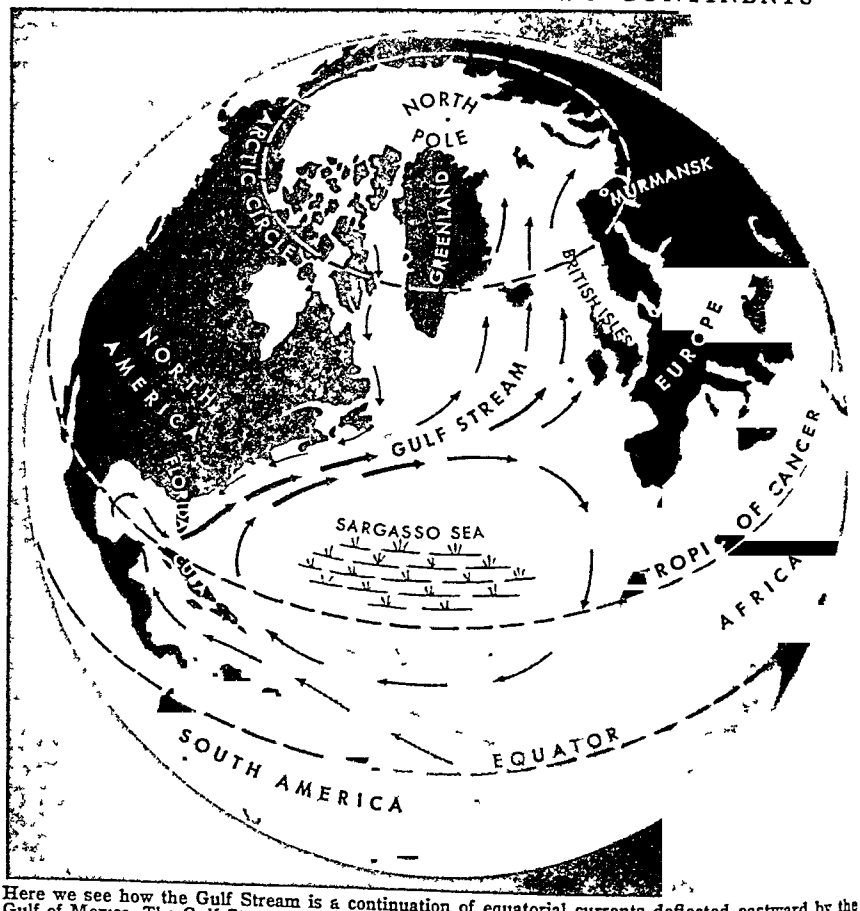
Because of the low shores there are few good harbors The most important are those of Key West Tampa Pensacola Mobile Galveston Corpus Christi Tampico Vera Cruz and Havana *From Florida to* the Mexican boundary the slope of the basin is very gradual Off the Mexican coast it drops rapidly to the submarine plain known as Sigsbee Deep which is about 12 750 feet deep The tides are relatively small

The Gulf exercises a great influence on the climate of the Southeastern states and the whole Mississippi Valley It saturates the southerly winds blowing across it with moisture The air releases the moisture as rain which falls most heavily on the coast and in smaller quantities as the winds move northward The temperature of the Gulf waters is eight or nine degrees higher than that of the Atlantic

GULF STREAM. In winter, travelers from New York to Bermuda may leave in blinding snow. During the night, as their ship plows southeastward, they encounter storm or fog The next day they find clear, blue water and milder temperatures because they have entered the Gulf Stream. This is a warm, blue current which flows from between Florida and Cuba northeast toward Europe.

At the same time, the peoples of western Europe are enjoying far more important benefits from the Gulf Stream. The British Isles are as far north as Labrador, and they receive no more heat from the sun. Bordeaux, France, is nearly as far north as Montreal. Yet these and other parts of western Europe enjoy mild winters, while Labrador and Montreal are subjected to intense cold. The difference is caused by comparatively warm westerly winds which blow over western Europe from the Gulf Stream (*see* Climate).

THE GULF STREAM WASHES TWO CONTINENTS



Here we see how the Gulf Stream is a continuation of equatorial currents deflected eastward by the Gulf of Mexico The Gulf Stream proper begins between Florida and Cuba, moves with west winds to Europe, and is deflected northward into the Arctic. With its tributary currents, the Gulf Stream forms a vast eddy that encircles the Sargasso Sea, which is noted for its wide variety of marine life.

The Cause of the Gulf Stream

As explained in the article on the Atlantic Ocean, the Gulf Stream is one of the great ocean currents which are caused by the same forces that give us climate—particularly the planetary winds (*see* Winds).

The trade winds over the Atlantic Ocean continually drive warm surface water into the Caribbean and across this sea until the water reaches the Yucatán Channel between Yucatán and Cuba. Here the water can go no farther west because the waters of the Gulf of Mexico are in the way. The current is forced out, therefore, through the Straits of Florida between Florida and Cuba, a span of not quite 110 statute miles. This is considered the origin of the Gulf Stream.

The stream is then forced northeastward between Cape Florida on Biscayne Key off Miami and the Bahamas. The average flow here is estimated at 14 cubic miles, or 100 billion tons, of water an hour The average speed is four statute miles an hour. This part of the Gulf Stream is called the Florida Current After merging with a similar current from the open Atlantic, the stream runs roughly parallel to the North American seacoast. North of Cape Hatteras it swings farther eastward, forced out by cold water close to the shore. The stream's surface temperature here is about 88° F. in summer and 79° in winter. Traveling ever more slowly, the main stream skirts the Grand Banks of Newfoundland and joins the North Atlantic Drift. Its temperature is still much warmer than the surrounding water, about 72° in summer and 50° in winter. Finally it crosses the North Atlantic to warm the British and northern European coasts before losing itself in the Arctic Ocean.

The Gulf Stream, discovered by the early Spanish navigators, was chartered and named by Benjamin Franklin. In 1950 and 1951 the Hydrographic Office of the United States Navy conducted an extensive survey of the stream with the co-operation of merchant tankers. This permitted accurate charting of the seasonal changes in the stream's course. (*See also* Ocean.)

GULLIVER S TRAVELS Perhaps the most famous traveler in the h story of the world was Lemuel Gul- l ver first a surgeon and then a capta n of se e al *sh ps Yet th s celebrated voyager ne er existed* except in the mind of Jonathan Sw ft the 18th century author of Gulliver s Travels Sw ft was so persuas ve a writer that everyone who reads his great book soon finds himself thinking of its hero as if he were a real person

The author s name d d not appear with the book when it was published n 1726 The t tle page read Travels into several remote Nat ons of the World by Lemuel Gulliver Many people took this ser ously Great numbers of travel books we e then beingpub- l shed and many tales told in tl ese were hardly strang er than the imag nary adventures of Gull ver One sea capta n even cla med that he knew Captain Gulliver well Other readers while they took the book ser ously condemned it as full of exagge ations

Gulliver s four voyages take h m to lands nhab ted by strange beings Sh pw ecked on his first voyage he finds h mself cast away in the country of L ll put, whose inhab tants *are only* six inches tall Gul liver by reason of his great s ze and strength s able to help the Lill put ans in many ways H s great- est feat is h s single handed *capture of an enemy* fleet threaten ng the coast of L liput

GULLIVER AND THE HOUYHNHNMS



One of Gulli er s voyages took him o the country of the *Houyhn-* hnms a a e of n e igen horses These animals are served by he disgus ing Yaho s ap sh caricatures of *human ty*

THE INHABITANTS OF LAPUTA



On anothe voyage Gulliv vis ed the Flying Island of Laputa and the p y urvy y of Lagado In these mad ands few talk sense and the wi e men are so absen minded tha in conve sati n hey mu be kep alert by boys wi h ra tles

On h s second voyage Gull ver rea hes the land of Brobd ngnag inhab ted by human beings 60 feet in he ght These people are gentle and kind Gulliver s constant compan on is a little g l named Glumdal cl tch Desp te her attent ons poor Gul ver here *has a terr fying encounter* n th a *giant pet span el* wh ch carr es h m off n ts mouth

H s thi d voyage takes h m to several remote places includ ng the *Flying Island of Laputa* The ph los- ophers of th s land are so absent-minded that they h re boys to go about with them and rou e them w th rattles when their attent on wanders

On h s fourth and last trip Gulliver is set ashore by mut nous sa lors and finds himself in the land of the Hou hnhnms (*wh n mz*) These are intelligent horses w th all the best qualit es of h man beings and none of the r vices The r se vants are Yahoos horrid human beings with none but bad qualit es Gulliver would gladly have l ved the rest of h s life with the Houyhnhnms, but they regretfully send him away

Gull ver s Travels is actually a b ting satire on human vices and follies But t can be read simply as a *story of strange* adventures, and that is how many people choose to read t For children s use the book is usually published in abridged form Adults who wish to read t *should be sure to get the original* vers on (*See al o* Sw ft)

LONG-DISTANCE *Flying Champions of the* WORLD

GULLS AND TERNS. Long before airplanes flew over the ocean, gulls and terns were making transatlantic flights. Travelers declare that the same bird has followed their vessel the entire 2,500 miles from Ireland to New York, living on refuse thrown out from the ship, and occasionally resting on the waves. Bird banding furnishes more reliable evidence. Terns tagged in Labrador have been picked up in France and South Africa. Gulls banded in Germany and England have been found all the way from Labrador to Mexico.

Most of the gulls and terns migrate enormous distances between their winter and summer homes. The record for long-distance traveling in the bird world goes to the Arctic tern, which makes an annual round trip of 20,000 miles. It nests in the Arctic regions, and as soon as the young are grown the whole family departs for the Antarctic Continent. As one would expect in birds capable of such flights, their wings are long and powerful, so that they can make steady headway against the strongest gales. They have webbed feet, so that they are at home in the water and swim easily. Most of them are sea birds, but several species live and breed on inland lakes and marshes. They are exceedingly sociable and nest in colonies of thousands, sometimes millions. The nests are usually made of reeds, grasses, or seaweed and are built on the ground, on rocky ledges, or on the water in reedy marshes.

Gulls and Terns Compared

Gulls vary in length from 14 to 29 inches. The terns are smaller, from 9 to 21 inches long, and their bodies are slimmer and more "streamlined." Gulls have square or rounded tails; terns have long, forked tails. Gulls alight on the water to feed or rest; terns never do so, but hover and plunge for their food. Another distinction is that gulls usually fly with their bills on a line with the body, while terns carry theirs pointed downward. The prevailing color of both gulls and terns is white below and pearl gray above. In many species the head, wings, and tail are marked with black in summer months. The feet and bill are usually bright yellow or red. All gulls and terns are particularly fond of fish, dead or alive; but they will eat almost any other kind of food they find on the water or along the shore. Thus they are considered valuable scavengers.

Some gulls are friends of the farmer because they eat field mice and insect pests that harm crops and trees. In Salt Lake City stands a monument surmounted by the bronze figures of two gulls. It was erected "in grateful remembrance" of the service rendered the Mormon settlers when in 1848, the *California gulls* came in large flocks and destroyed millions of black crickets which threatened to destroy the crops. The California gull is the unofficial state bird of Utah.

Franklin's gull is abundant in the upper Mississippi Valley, where it follows the farmer's plow in search of grasshoppers and other insects. These small gulls have black heads and throats, resembling closely *Bonaparte's gull* of the coasts and Great Lakes. Franklin's gull is rarely found on the coasts, however, and Bonaparte's is

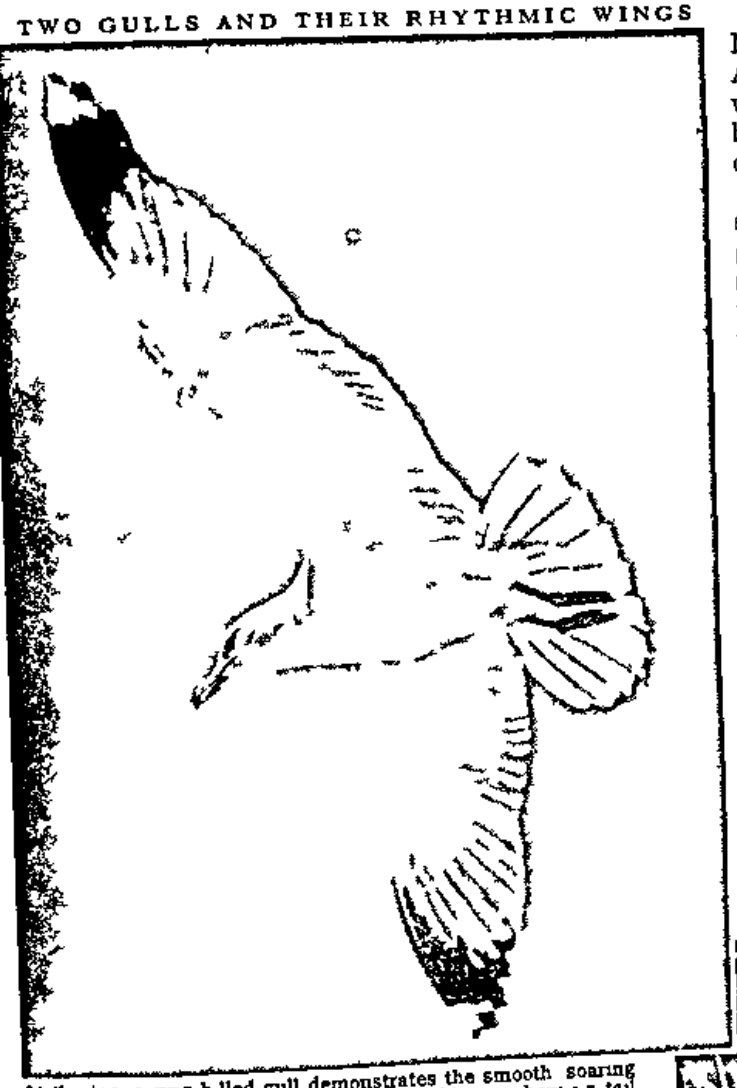
TERNS AS TOURISTS AND STAY-AT-HOMES





A common tern (top) shows how its long wings carry it tirelessly across the oceans as it screams down a resounding tee'arr, tee'arr. Its flight is flickering like that of a swallow. A black tern (bottom) stands ready to dart at anyone who would disturb those eggs in the crude nest of sedges and grass.

TWO GULLS AND THEIR RHYTHMIC WINGS



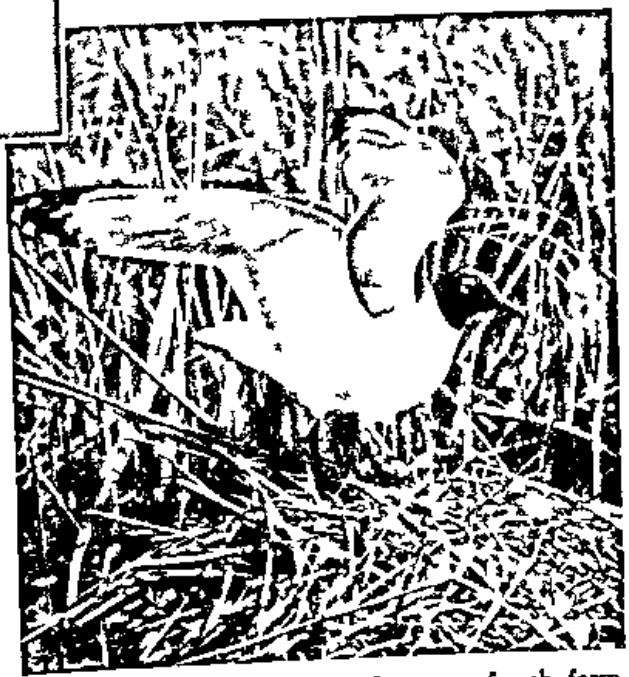
At the top a ring b lled gull demonstrates the smooth soaring fl ght that is characteristic of the gulls Observe how is tail differs from that of the tern Be ow a Franklin s gu l has alighted gracefully on its nest of dead rushes hidden deep in the marshlands Notice its dark hood and white eyelids

uncommon inland on the prairies The b g *herring gull* is the species most abundant along both coasts and in the Great Lakes region It often follows ships to feed on the garbage that is thrown overboard On the beaches it digs up clams and breaks them open by carrying them up into the a r and dropping them on rocks In company with the herring gull will often be seen the slightly smaller *ring-billed gull*

The largest of the family is the *great black-backed gull* which nests from Labrador to northern Russia and visits the Atlantic coast of the United States in the winter The clown of the group is the *laughing gull* which nests on the Atlantic coast south of Massachusetts and along the coast of the Gulf of Mexico It utters a loud laughter like cry and often al ghts on the head of a pelican to snatch a fish the b g solemn bird is preparing to swallow A true bird of the sea is the little *kittiwake* a far wanderer who rides the gales with ease and sleeps on the waves far from shore It nests among the rocky cliffs of the Atlantic and Pacific coasts

The *common tern* is found in all parts of the Northern Hem sphere as well as in South America and Africa With its pearl gray body white tail and black cap it is a beautiful bird The *Arctic* and *Forster s terns* can be distingu shed from the common tern only by an expert observer The *royal tern* is a common species on the southern coasts It is distin gu shed by its large size and in the breed ng season by a long black crest The *black tern* is a bird of the interior marshes and prairies where it feeds on insects during the nest ng season With its black head and underparts and its slate-blue back wings and tail th s small bird is eas ly mistaken at a distance for a purple martin

Two other types of terns—the *noddy* and *sooty terns*—breed on the Dry Tortugas off the southwest coast of Florida and winter in South America The sooty tern is black with white underparts and outer ta l feathers The noddy is the only tern with a rounded ta l It is dark brown with silvery head The *least tern* is the da ntiest of all sea birds Only about nine inches in length it s a pale blue color abo\e and white beneath It was once so ruthlessly killed for its beautiful feathers that it came near to extinction and is still relatively scarce (For pictures in color of the common tern and the herring gull *see* Birds Egg)



Gulls and terns with about 50 species of each form the family *Laridae* Gulls belong to the subfamily *Larinae* terns to the subfamily *Sterninae* Scient fic name of the herring gull *Larus argentatus* of the com mon tern *Sterna hirundo* of the least tern *Sterna antillarum*

GUMS AND RESINS. Natural gums are the solidified juice or sap of certain plants. True gums are soluble in water or else swell up in water, but do not dissolve in alcohol. The word gum, however, is sometimes applied to true resins or mixtures of gums and resins (*see* Resins).

About 150 different gums find industrial uses. They go into adhesives, sizing (glazing) for silk and cotton fabrics, calico printing, candy, and pharmaceutical products as an emollient (soothing to mucous membranes) or as an emulsion.

Gums were once thought to be made up of carbohydrates. Now they are known to be composed of complex acids, called gum acids. When combined with dilute mineral acids, gum yields certain sugars. Gums are formed in shrubs and trees by conversion of cell tissues, most likely through the action of enzymes. In some plants gums are formed only when plant tissues are injured.

Perhaps the most important gum is gum arabic, which comes from the acacia tree (*see* Acacia). Gum tragacanth is a hornlike substance from Asiatic shrubs of the bean family. It is sometimes adulterated with a cheaper gum, bassora. Mesquite gum comes from several different shrubs that grow on the dry plains. Cherry and plum trees yield a dark-colored gum which is insoluble in water.

Copal gums, used in varnishes, are actually resins. Among them is kauri gum, which is a fossil resin from the kauri pine of New Zealand. The copals of Zanzibar and the Congo are also fossil remains, but in Sierra Leone and the Philippines copal is tapped from living trees.

The balsams are classed as oleoresins. Sweet-smelling balsams from South America go into perfumes and ointments. Canada balsam is used in mounting microscopic specimens and in cementing lenses.

Gum mastic, a resin from trees growing on the Moroccan coast and on islands of the Aegean Sea, is used in making brilliant varnishes. Dragon's blood, a red resin used in photoengraving processes, comes from a ripe fruit of several Siamese and East Indian palms. (*See also* Chewing Gum; Rubber.)

GUMWOOD. The red, or sweet, gum, the black gum, and the tupelo trees all yield the lumber known as gumwood. These trees are native to the southern swamp and bottom lands that are dry for much of the year. The heartwood of red gum ranges in color from light to deep reddish brown. The sapwood (known commercially as sap gum) is nearly white. Tupelo and black gum are grayish white.

Most of the furniture made today contains some gumwood. It is cheaper than such furniture woods as walnut, mahogany, maple, or oak. The gumwood may be used as a base over which a veneer of other wood is laid, or else the gumwood itself may be sawed and finished to bring out the best quality of its grain. Red gum, when quarter-sawed, has a mahogany-like grain and can be finished to resemble oak, cherry, walnut, or maple. It is widely used as a substitute for the expensive Circassian walnut. The wood's tendency to warp is overcome by expert cutting and seasoning. Red gum is also used as a veneer. Inferior grades of gumwood are used for boxes and crates. (*See also* Veneer; Wood.)

GUNPOWDER. The origin of gunpowder is unknown. Very likely no one person invented it; rather, its formula and uses were developed gradually from various "fire" substances. These were long known in many countries before they were adapted to military use.

The Chinese early had a knowledge of some such fire substance. "Greek fire," first used by the defenders of Constantinople against the Saracens in 673, is believed to have been similar to gunpowder. However, it was not used in projectiles but was simply set on fire and poured or hurled on the besiegers beneath the walls. The English Franciscan friar Roger Bacon and the German monk Berthold Schwarz, both living in the 13th century, described the composition of gunpowder (*see* Bacon, Roger). Its use in cannon is mentioned in the records of the city of Florence for the year 1326. Cannon may have been used in the battle of Crécy (1346); but they could have done little more than frighten the horses and men.

The first important use of gunpowder was to blow up or batter down the castle walls of rebel barons. Thus they could no longer shut themselves up and defy their king. Later, gunpowder was used in small arms, helping to make the common soldier with a gun more deadly in war than a mounted knight in armor.

The gunpowder of the early days was much the same as the common black powder of today. It consisted of a mixture of saltpeter (potassium nitrate, or niter), charcoal, and sulfur. The proportions of these chemicals have varied greatly from time to time, a

AN EARLY SIEGE GUN IN ACTION



This siege gun of the 15th century was one of the first to make effective use of gunpowder. The cannoneer in the center is looking at the target through a primitive view finder.

fair modern standard being 75 per cent saltpeter 15 per cent charcoal and 10 per cent sulfur These ingredients are ground to a fine dust thoroughly mixed into a moist paste pressed into cakes and dried The cakes are then broken by rollers into grains of varying size wh ch are glazed by friction against each other in revolving barrels The char coal used in gunpowder is specially prepared from dogwood willow or alder All operations are carr ed on in small separated buildings so that the danger of great destruction by accidental explos ons is re duced to a considerable extent

Except for blasting work and for certain spec al military purposes the old style gunpowders have been almost entirely replaced by the smokeless pow ders and the high explosives such as guncotton mercury fulminate nitroglycerin and dynamite Smokeless powders (products of guncotton and nitroglycerin) were first perfected in 1884 and put to military use by the French (*See also* Dynamite and Nitroglycerin Explosives)

GUSTAVUS ADOLPHUS KING OF SWEDEN (1594 1632) For 12 years in the first half of the 17th cen tury Germany had been devastated by the Thirty Years War Towns had been destroyed men wom en and children massacred and the country plun dered Everywhere the Catholic and imperialist party was triumphant and it seemed as though the Protestant faith would be swept out of the land Then in 1630 the tide was completely turned by the appearance of a new leader for the Protestants—Gustavus Adolphus king of Sweden one of the great est generals in the history of warfare

Born in Stockholm castle Gustavus Adolphus was the son of Charles IX He had been trained from childhood for his kingly dut es When he was only nine years old he began to take part in public affairs and in 1611 at the age of 17 he had mounted the throne as Gustavus II So carefully had he been trained that before he was 20 years old he had won a war against Denmark and by 1630 he had extended his kingdom around the whole eastern shore of the Baltic by successful struggles w th Russia and Poland (*See also* Sw eden)

Gustavus Adolphus was led to enter the Thirty Years War not only because he was an enthusiastic Protestant who hoped to relieve the misfortunes of the Protestant cause in Germany but also because he dreamed of extending his kingdom even to German shores so that the Balt c might indeed become a Swedish lake France under Cardinal Richelieu as minister gave him money for his expedition to further French pol tical aims

When Gustavus landed in the north of Germany his army was not large but it was well tra ned and disciplined He was the greatest military genius of his t me and set an example for modern leaders by supplying his men from fixed bases instead of leaving them to live off the country by foraging and pillage At first he was coldly received by the Protestant rulers of Brandenburg and Saxony but they were brought to the r senses after the awful destruction of

GUSTAVUS ADOLPHUS BEFORE HIS LAST BATTLE



Gustavus Adolphus is praying just before the battle of *Lützen* His army won a brilliant victory but the king was killed. Near the spot where he fell a gran te boulder was placed after the battle and in 1832 a cast iron canopy was built over it.

GOING TO PRESS IN THE OLD DAYS



What a contrast between the primitive machine shown here and the great modern high-speed presses shown in the article Books. Gutenberg is showing one of the sheets from his press to Johann Fust, one of his partners in the printing firm at Mainz. This simple machine, merely a development of the old-fashioned cider or cheese press, remained in use without improvement for a century and a half. Only two pages of a large book could be printed at one time on such a press.

Magdeburg by the imperialist forces and the foolish religious policy of Emperor Ferdinand II. In the famous battle of Breitenfeld, near Leipzig (Sept. 17, 1631), Gustavus overwhelmingly defeated the imperialist army under its famous commander Tilly.

Gustavus then pushed westward, through the "priests' lane" of rich bishoprics and monasteries of the river Main, to Mainz on the Rhine, where he established his brilliant winter court. In the spring he again took the field, and a second time defeated and now mortally wounded the aged Tilly in Bavaria. In this emergency the Emperor took the humiliating step of recalling the imperialist general Wallenstein, whom he had dismissed just after Gustavus had landed on German shores.

After weeks and months of maneuvering, one foggy day in November 1632, Gustavus succeeded in bringing Wallenstein to bay at Lützen, only a few miles from the site of his first great triumph. Again the Swedish troops gained the victory, but the battle was won at the cost of the life of their beloved king, for Gustavus fell wounded into the hands of the enemy and was dispatched as he lay. He was the greatest king that Sweden ever had. With his death "all moral and religious ideals died out of the Thirty Years' War," and it became a mere struggle for political power. (*See also* Thirty Years' War.)

GUTENBERG, JOHANN (1400?–1468). Neither printing nor movable type was actually invented by Johann Gutenberg. Nor did he print the first book. But Gutenberg made printing practical, and his achievement stands as one of the greatest advances in civilization.

Gutenberg was not always so recognized. The facts of Gutenberg's life were so little known that historians gave the names of other men in Holland, Italy, France, China, and Japan as being the first printers. But historians are now agreed that the honor of the title "father of printing" should go to Gutenberg, an obscure German goldsmith.

Before Gutenberg, printing was used only to reproduce pictures, playing cards, designs on cloth, and similar items. The designs were cut in wood, stone, or metal, and transferred to parchment or vellum. Sometimes a few words of explanation were cut into the printing block, but that was the limit of text printing. Books were copied by hand by monks or professional copyists.

Gutenberg's Life and Work

Gutenberg was born in Mainz, Germany, about 1400. His father was Friele zum Gensfleisch, a goldsmith. Johann took his mother's last name for his own, following the custom that one son should carry on the mother's family name. His father was entrusted with stamping designs on gold coins, and this may have given the boy the idea of printing from metal. After his father's death, Johann moved to Strasbourg. There he worked as a goldsmith and maker of mirrors, and also served as a policeman. In 1438 he became a partner in a block printing firm. During those years he experimented with wood and metal type.

Gutenberg probably did not know that the Chinese had printed from movable type about A.D. 1040, later discarding the method. He invented movable type all over again for the Western world. He used sand molds

to cast his type and changed the woodcut presses to take printing of type pages About 1444 he returned to Mainz to set up his own press

At first he produced mere scraps of printing such as pages of prayer His first book was a Latin grammar printed about 1446 In 1450 he went into partnership with Johann Fust and Peter Schoeffer In this shop he set type for a Bible Before it was printed he quarreled with his partners and withdrew from the firm Fust and Schoeffer printed the Bible from the type set by Gutenberg

Gutenberg then set up his own press and in 1457 printed the Bamberg Bible Later he printed a religious grammar and the Catholican a religious dictionary In all he produced only about 50 pieces of printing In 1465 he was granted a pension by the Archbishop of Mainz in recognition of his printing for the church He died in Mainz in 1468

Today the few copies of the Gutenberg Bibles that remain are the world's most valuable books The first set by Gutenberg and printed by Fust and Schoeffer is known as the 42-line Bible because most of its pages are 42 lines long It was printed in three volumes The Library of Congress has a complete and perfect set There are 23 other volumes in American libraries and museums Only 16 copies of the Bamberg Bible with 36 lines to the page remain

GUTTA PERCHA (*gŭt'ə pûr'chə*) Most of the ocean cables which link the nations of the world are covered with gutta percha the juice or milky latex of a tree which grows in the Malay Peninsula in Borneo Java Sumatra and the Philippine Islands It is more familiar to us in the form of rubberlike covers of golf balls in some knife handles in adhesive and waterproofing materials in protective clothing for chemical workers, in dental packing and dental plates and in certain kinds of surgical instruments It makes the best cable covering because it is tough strong and stable under water and is highly insulating It is sometimes used as a substitute for rubber or is mixed with rubber to make the rubber plastic

Gutta-percha is gathered like rubber by tapping the inner bark of the tree However a gutta-percha tree must be 30 years old before it *is ready to* be tapped A tree may give from a few ounces to three or more pounds at a tapping mostly from the higher parts of the trunk The gutta is washed *free from* dirt and bark and molded into compact slabs by being immersed in hot water and kneaded with the hands Gutta is stored under water to prevent oxidation which makes it brittle

Cultivated trees give the best yield Some can be tapped more than once at intervals of perhaps two years so the native method of felling the tree to collect the gum is wasteful and the Malayan government attempts to prevent it Tapping provides the best gutta but it may also be obtained from the leaves twigs and the ends of the smaller branches by cutting grinding and boiling The gutta *separates* in the boiling and rises to the top

Rubber balata chicle jelutong and other products are all related to gutta in general chemical composition and all come from tropical plants Gutta unlike rubber is not elastic but it is plastic when warmed and can be molded or rolled into sheets

The gutta percha tree grows in scattered patches among other trees generally near the coast line The long narrow pointed leaves are a smooth dark green and have small white blossoms near the ends of the branches True gutta-percha comes from the tree *Palaquium oblongifolia* of the family *Sapotaceae* though many other species contribute to commercial gutta percha

GYPSIES In Europe and America a little-known people preserve an ancient and distinct way of life These people are the gypsies who have been wanderers for nearly a thousand years During the warm months small bands of them are constantly on the move In the United States and Canada they travel by automobile and sleep in tents or trailers at night In Europe many of them travel and live in a horse-drawn caravan a kind of house on wagon wheels During the winter gypsies live in houses apartments and even empty stores but in the spring they resume their travels In recent times some gypsies have settled permanently but they live apart from their nongypsy neighbors

The gypsies are usually short slim and swarthy The women dress gaily with red and green scarves and sashes and heavy glittering jewelry The men also like bright colors and jewelry Children dress largely in rags and castoff clothing and run barefoot throughout the summer Gypsy standards of hygiene and diet are primitive but the people stay healthy as long as they remain outdoors

On the road gypsies earn their living by peddling by mending (tinkering) pots and pans especially copperware and by telling fortunes at small fairs and carnivals They gather herbs in the woods and sell *them* Many gypsies are musical and have remarkable self taught skill at the violin

Proud clannish and devoted to their traditions the gypsies have resisted attempts to make them like other people Their children attend school only to comply with local school laws for gypsies fear that formal education will make children forget gypsy ways Many older gypsies cannot read or write and what they know of themselves and their past is largely communicated by word of mouth

The Gypsy Past

In continental Europe the gypsies are called tziganes (the spelling varies from country to country) The word gypsy is a corruption of Egyptian and *gypsies* like to think that their ancestral home is Egypt Actually they originated in northwest India They had been one of the nomadic tribes of that region and for centuries they never went beyond the borders Then about A D 1000 they ventured westward They moved slowly across Iran Armenia and into the Byzantine Empire By the 1300s they were established in the Balkans and Hungary

Here some of the gypsies settled as serfs on the lands of noblemen and churchmen. Others were given permits to wander. These wanderers became tinkers, wood carvers, and minstrels. The men panned for gold in the rivers, and the women told fortunes. By about 1500, gypsy bands reached the British Isles. There and in western Europe they added horse trading, horseshoeing, and care of sick animals to their trades. They developed the reputation of being shrewd and tricky, and they often indulged in petty thievery. Yet their skills at tinkering and animal care were sought after, and outsiders were delighted by their violin music and their mysteriously accurate predictions with the tarot fortunetelling cards.

Gypsy Language, Government, and Religion

The word *rom*, or man, gives the gypsy language its name, Romany. There are many dialects of Romany, but all are based on Sanskrit, the ancient language of India. Wherever they have lived, gypsies have absorbed many of the local words into Romany, and from Romany have come such slang words as *pal*, for friend.

Gypsies have always been subject to national and local laws; in addition, they enforce obedience to their own customs. Each band has its own chief; a so-called "king" is merely the head of a large band and has no power over another band. The chief acts as head of a tribunal that punishes offenses against gypsy law, and he deals with outsiders who have business with his band.

There are Moslem, Roman Catholic, Orthodox, and Protestant gypsies. Their choice of religion has largely followed the prevailing faiths of the countries in which they have lived. However, they have their own baptism, marriage, and burial ceremonies which they practice in preference to the rites of their church.

GYPSY GIRL AND HER CARAVAN



In camp this girl cleans her kerosene lantern. Notice the elaborate carving on the caravan and the houselike furnishings within.

Among the books which have been written about gypsies, some of the most interesting are George Borrow's 'Lavengro' and 'Romany Rye', stories of gypsies in England; W. F. Starkie's 'Raggle Taggle', an account of a scholar-musician's wanderings with gypsies, and Konrad Bercovici's 'Story of the Gypsies', about the life of Rumanian gypsies. The Gypsy Lore Society has branches in Europe and America and makes scholarly studies of gypsy life.

GYPSUM. The abundant mineral gypsum is composed of calcium sulfate in combination with water. Its chemical formula is $CaSO_4 \cdot 2H_2O$. Translucent varieties are known as *selenite*, and very fine grades of the material, of white color and special luster, are known as *alabaster*, valued for making statuary and ornaments. This is not to be confused with the alabaster of ancient times, which was a fine marble used for vases and ornaments. Most commercial gypsum occurs as rock gypsum, which is mined from thick beds like those of coal. Some surface deposits are found, others occur far below the surface. Gypsum beds hundreds of feet thick are found in west Texas over hundreds of square miles.

Ocean water contains much gypsum. Most gypsum has been formed by precipitation from water that was cut off from the sea and later dried up. Large crystals of selenite are sometimes found in caves, as in the Mammoth Cave in Kentucky. Many so-called "hard" waters contain calcium sulfate.

Gypsum has been used as a plaster and building material since early Egyptian times. When heated it loses part of its water of crystallization. At this stage it is often called plaster of Paris. If it is then mixed with water, it becomes plastic and takes up the water again, recrystallizing to form a soft yet rigid cementlike material. Alone or mixed with sand or lime this can be molded into casts, stucco, tiling, or finishing plasters; or made into lath, wallboard, or blocks. Stage and motion-picture settings and similar temporary structures are made of gypsum wallboard and plaster of Paris, as are the casts used by sculptors, surgeons, and dentists.

A mixture of gypsum plaster with a little cement, dextrin, and tow (coarse flax or hemp) to give it strength forms a light building material called "staff." This is much used in constructing temporary buildings. The material is so light that wood instead of steel framework may be employed.

Gypsum wallboard and tiling resist fire and water well, and they insulate a building against both heat and cold. Such boards or blocks can be nailed and sawed like wood, replacing wood for many uses. Artificial gypsum, formerly a waste product in phosphate fertilizer manufacture and other chemical industries, is used in making building tile. In the United States gypsum deposits are worked in New York, Iowa, Michigan, Texas, and many other states.

SPINNING TOPS *that Guide* SHIPS *and* PLANES

GYROSCOPE. The spinning of a top the rotation of the earth on its axis the whirling of a rifle bullet point-first toward its target the long sailing flight of a spiral punt down a football field—these are all common illustrations of that peculiar phenomenon that scientists call *gyroscopic force* Suitably harnessed this force will keep an airplane flying straight and level without a hand on its controls or guide a ship on its course despite wind or waves or permit a railway car full of people to run straight or around curves at high speed while balanced on a single rail

Any object spinning around its axis will develop gyroscopic force but the best illustration of the principles involved is provided by the toy gyro top which is essentially the same as the common laboratory gyroscope This consists simply of a heavy wheel with its axle pivoted inside a ring This ring in turn is pivoted in a gimbal frame as shown in the picture in the middle of this page Such a mounting permits the wheel to be tipped and turned in every possible position and direction

So long as the wheel is not rotating it offers of course virtually no resistance to being tipped and turned But now let us set the wheel spinning by winding a string around the axle and then pulling it away sharply Immediately the gyro-wheel seems to become imbued with a strong and perverse will of its own Pick up the stand and walk around with it No matter which way you turn the axle will continue pointing in the direction it had when it started spinning Set the stand back on the table and try with your finger to push the end of the axle out of its position Not only will it resist you but it will stubbornly move at *right angles to the direction in which* you push it If you try to force it around horizontally to the right or the left it will move up or down and if you try to push it up or down it promptly moves horizontally

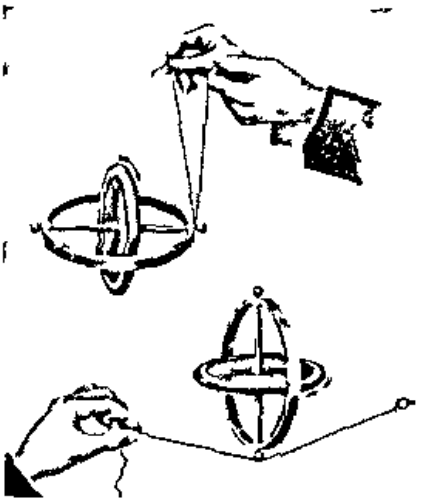
Thus you have illustrated the two great gyroscopic principles which apply to every rotating body First it has *rigidity in space* which tends to keep its axis pointing continuously in the same direction and second when this space rigidity is disturbed the rotating body tends to turn so that points on its rim will be moving in the same direction as the disturbing force This last is called the principle of *precession*

This explains why spinning tops stay erect and why planets or rifle bullets do not turn end-over-end in flight Also it explains how the earth under the conflicting attraction *of other heavenly bodies* wobbles slowly on its axis producing among other effects what is called the precession of the equinoxes (*see* Earth Equinox)

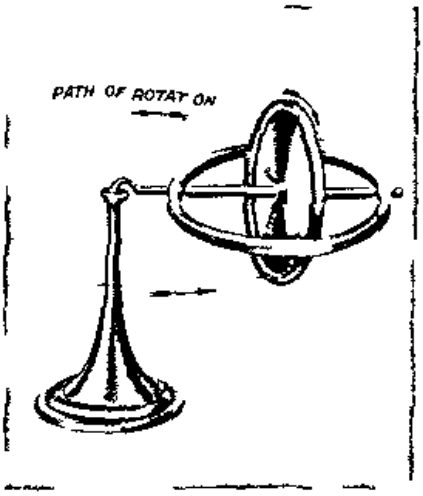
In practical use gyro-wheels are *usually electrically driven* When well balanced they are sensitive to extremely small changes in position Hence their great value as automatic gauges and controls A gyroscopic recorder aboard a speeding *railway car will trace on a* paper roll an accurate line showing every fault in the level of the tracks Huge gyroscopic stabilizers *prevent* ships from rolling with the waves while other craft which have to break their way through ice are made to *roll by oscillating gyro-wheels*

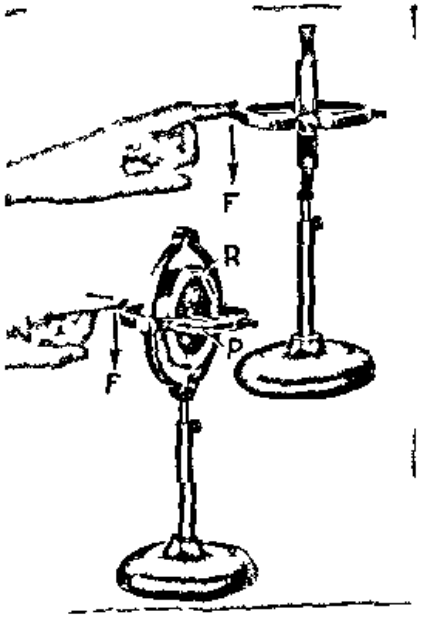
The turn-and bank indicator on many airplanes is a simple gyroscopic device which tells the pilot flying through darkness or fog when his ship gets off its straight and level course The mechanism is a

SOME OF THE QUEER ANTICS OF THE GYROSCOPE



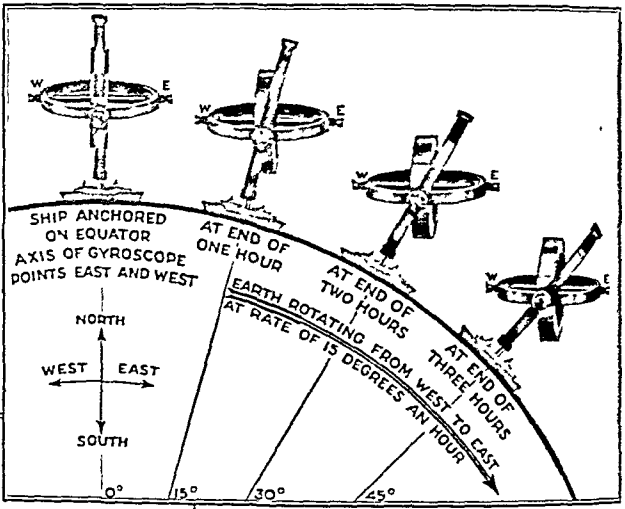
Here is demonstrated the gyroscope's tendency to stay put in the position in which it first starts spinning At the left a toy gyro-top is standing out horizontally as though only one end is supported by the string A second top is securely walking a tight rope Below we see what happens when we disturb the rigidity in space as it is called of a small laboratory gyroscope Instead of tipping when pressed down lightly it turns around sideways on a vertical axis in the direction shown by the arrow P This effort *of the spinning wheel to get* around so that its edge will be moving (arrow R in the same direction as the finger pressure is called precession A case of continuous precession is shown at the right where a spinning gyro-top whose free end is being subjected to the pull of gravity turns round its supporting stand like a dog chasing its tail.

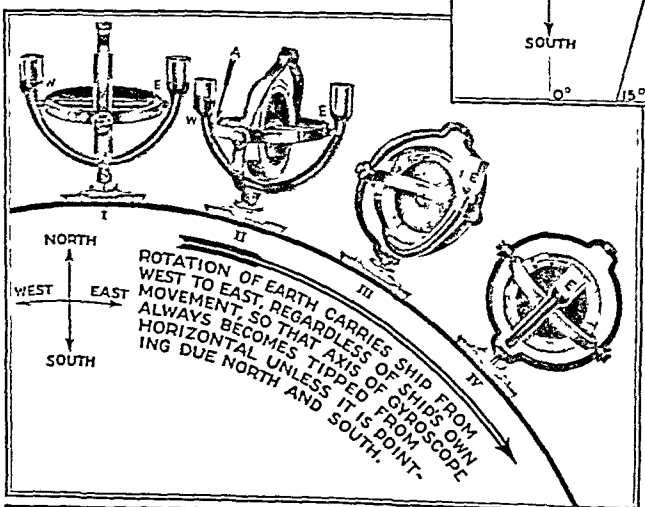




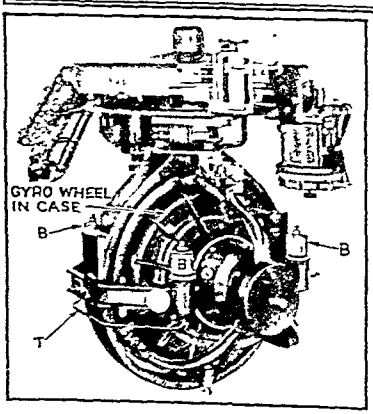
HOW A GYROSCOPE IS TURNED INTO A COMPASS

To understand the picture at the right imagine yourself suspended in space and looking at the earth from south of the Equator. A giant gyroscope aboard a ship is being carried around by the earth's rotation. The gyro-axis W-E points east and west. For the sake of simplicity in picturing angles, we have anchored the ship on the Equator, although, as the next picture shows, the ship's position or motion would make little difference. As the gyroscope is carried around, note that its "rigidity in space" holds the wheel parallel to its original position, so that the W end of the axis, still pointing west, dips more and more toward the earth. Now study the picture below. The original conditions are the same, except that a U-tube with enlarged ends, containing mercury, has been fastened to the axis supports of the wheel's frame. As soon as the west end of the axis starts to dip toward the earth, the mercury under the leveling force of gravity flows to that side of the tube. This results in a greater downward pressure on the





west end than on the east end of the axis. Precession, as illustrated with finger pressure on the previous page, sets in; and what was the west end of the axis turns toward the north. The turning continues until the mercury is balanced in the U-tube, a condition that can only exist when the axis of the gyro and the axis of the earth are in the same plane, or, in other words, when the axis of the gyro points in exactly a north-and-south direction. For purposes of illustration, the angles assumed by the gyro in the pictures have been greatly exaggerated.



In this Sperry compass, the gyro is part of an electric motor and is kept spinning about 6,000 to 8,000 times a minute inside its case. A pair of mercury containers B on each side correspond to the ends of the U-tube in the previous picture. The tube T connecting each pair is so small that the mercury will not flow rapidly back and forth as the ship rocks, but will respond only to prolonged tipping of the gyro-axis. When this happens, the gyro precesses, and the motion is communicated by its vertical supporting ring through electrical contacts to an auxiliary motor which keeps the compass card aligned properly with the gyro.

more powerful device connected to the controls so that the plane's dips and turns away from the course are automatically corrected.

In 1911 Elmer A. Sperry, of Brooklyn, demonstrated the practical value of his now famous gyrocompass. How this device manages to harness the force of gravity to a gyro-wheel so that the axis of the latter will always seek the north-to-south line is explained by the accompanying pictures. Gyrocompasses are now the standard equipment on all large ocean-going steamers since they are free from the faults of the older magnetic compass (*see* Compass, Magnetic). The gyro-pilot, which sailors call "Metal Mike" or "Iron Quartermaster," is an automatic steering mechanism connected to the master compass. It corrects each small drift or yawing of the vessel, holding it more closely to its course than could any human helmsman (*see* Navigation). The controlling mechanism can be disconnected whenever it is necessary to steer by hand as in passing ships or entering harbors.

Aviation instruments based upon the principles of the gyroscope include not only the gyrocompass and the gyropilot, but also the artificial horizon and the directional gyro (*see* Airplane). Gyroscopes also hold torpedoes steady on their course.

The first gyroscope was suggested in 1836 by Edward Sang as a device to illustrate the motions of the earth. Jean Foucault actually made one in 1852, and gave it its name, at the same time starting the studies upon which our knowledge of its action rests.

HAARLEM, NETHERLANDS Five miles from the North Sea lies the city of Haarlem capital of the province of North Holland During the Netherlands revolt against Spain it was the scene of one of the bitterest sieges in history Twice the Spanish army stormed its walls and both times the townspeople drove off the attackers The Spaniards then laid siege to the city The Dutch food supply was soon exhausted but rather than surrender the people ate dogs cats rats leather and grass

After seven months of siege the defenders agreed to surrender in July 1573 In return the Spanish commander promised mercy But when the invaders entered the city they slaughtered more than 2 000 of its citizens In 1577 William the Silent prince of Orange freed Haarlem from Spanish rule and the city became part of the United Netherlands

The modern city lies in the heart of the bulb-growing district In spring tulips and hyacinths spread a brilliant carpet of blossoms around the city Their bulbs are exported Haarlem's industries include the manufacture of cotton goods printing brewing and construction of streetcars and railway carriages

The city is slashed with canals and dotted with gabled houses The Cathedral of St Bavon called Groote Kerk ('great church') dates from the late 15th century Another place of interest is the Fleshers' Hall (meat market) built in 1603 Tourists also enjoy the monument erected in 1950 to commemorate the legend of the boy who held his finger in the dike to hold back flood waters Haarlem was the home of Laurens Coster printer, and Franz Hals artist (*see* Hals) Population (1947 census), 156 856

HABEAS CORPUS (*hā bē-ăs kôr'pŭs*) When a person is held prisoner against his will a judge may upon reasonable demand issue an order compelling the jailer or other custodian to bring the prisoner to court and explain why he is held captive If no lawful reason is found the prisoner is released This court order is called a writ of habeas corpus often known as 'the great writ of liberty"

The term *habeas corpus* comprises the first two words of the old Latin legal form which said "Thou shalt have the person' of the accused in court at such and such a time The principle of the writ is of English origin for in Magna Carta King John was forced to promise that 'no free man shall be taken or imprisoned except by the lawful judgment of his peers and by the law of the land Under this principle no one could be arrested and held in confinement on mere suspicion without being formally accused of a crime

This remained one of the mainstays of English liberty until Charles I set up the claim that a royal command was a sufficient answer to a writ of habeas corpus This misguided policy with similar arbitrary acts cost the king his life The result was that under

THE TOWN SQUARE IN HAARLEM



Most buildings in Haarlem show typically Dutch features such as gabled roofs The most modern building seen here is the motion picture theater, named for the great Dutch painter Rembrandt The statue is that of Laurens Coster with his printing press He is believed by some to have preceded Gutenberg in the use of movable type for printing.

Charles II the famous Habeas Corpus Act was passed. It extended the principle to mean that any person imprisoned to await trial for any crime except treason or felony could demand and obtain his freedom under bail. Bail is the pledge, or bond, of some responsible person to pay a fixed sum of money if the accused person fails to appear for trial.

The amusing manner in which this law passed the House of Lords is told by Bishop Gilbert Burnet in his memoirs. The lords who approved the bill had all filed out, as is customary when voting, and were returning to be counted as they entered the door. "Lords Gray and Norreys were named to be tellers," says Bishop Burnet. "Lord Norreys, being a man subject to vapors, was not all attentive, so, a very fat lord coming in, Lord Gray counted him for ten, as a jest at first; but seeing Lord Norreys had not observed it, he went on with this misreckoning of ten, so it was reported that they who were for the bill were the majority, though it indeed went to the other side."

The Constitution of the United States declares that the "privilege of the writ of habeas corpus shall not be suspended, unless, when in cases of rebellion or invasion, the public safety may require it." The privilege was suspended by President Lincoln during the Civil War, at first without the sanction of Congress. In 1863 Congress voted to give the president that power. Later the Supreme Court ruled that the president does not have the power of suspension unless specifically authorized by Congress. All state governments guarantee the writ except Louisiana, which bases its legal system on the Napoleonic Code. This code makes no formal provision for such a writ.

HABIT. Man would be in a sorry plight if he were unable to form habits. Everything he did would require watchful attention. Washing, dressing, and eating would occupy all his time. His hands would fumble at buttons, and tying his shoelaces and necktie would be as difficult as if he had never made a knot before. At the end of the day he would be exhausted by the continuous effort of concentration on the petty details of every action.

Fortunately for us, "practice makes perfect." We learn to perform mechanical tasks so that we can repeat them again and again without further thought. Thus while we are dressing, we can carry on a conversation about other things. Many women can knit without looking at their needles and read a book at the same time. Houdini could juggle four balls while solving problems in arithmetic. Habits governing general conduct are equally valuable. They keep us to a routine, regulating the time of our rising and going to bed, our hours of work and play, and so relieve us of the strain of always making decisions. Because of the regularity of habits, we are able to rely on the actions of our associates. Without the assurance that people will behave today very much as they did yesterday, co-operation between men and orderly government would be impossible.

Habits begin developing in early childhood. Some are acquired by observing and copying the behavior patterns of other people. We learn to smile when others smile and to speak as others do, even to the extent of acquiring their accents. Simple motor habits, such as buttoning our clothes, are learned by a process of trial and error. Successful movements are repeated until a habit is formed. Complex patterns of activity, such as reading, writing, and professional skills, are acquired by doing certain acts carefully and repeatedly without variation. In learning to play a piano the student must at first think of each separate note and key and finger. Gradually he learns to coordinate the various acts so smoothly that he is not aware of the separate movements. Each step automatically supplies the stimulus for the next in a continuous chain.

If we want to acquire a new habit or break up an old one, two important rules must be followed. First, we must launch ourselves strongly on the new course and seize the first opportunity to act on our resolution. Second, we must allow no exception to occur until the old habit is broken or the new one firmly rooted. Each lapse is like letting fall a ball of string we have been laboriously winding up.

In addition to everyday motor habits such as walking and talking, people also develop mental and moral habits. These are characteristic ways of thinking or acting in response to certain stimuli. The honest man does not think of stealing even though money may be within easy reach. Through the years he has acquired the habit of honesty until he is no longer conscious of making such a decision.

Groups of people also build up similar habits. In a well-ordered democracy citizens accept the verdict of the majority of voters in an election. On the other hand, blind obedience to a dictator or monarch is also largely a matter of habit. Such habit patterns have a great influence in shaping the character of an individual and the culture of a group.

HADDOCK. The common cod has a close relative in the haddock. Of the two, the haddock is the smaller fish. The average weight is 2 to 4 pounds. The maximum weight is 15 pounds. The haddock has a smaller mouth than the cod and a black lateral line in place of the white line on the cod.

The haddock lives on both sides of the North Atlantic Ocean, ranging in United States waters from Maine to New Jersey and off Cape Hatteras. Spawning occurs from January to June on the offshore banks. The eggs hatch in about 13 days.

Though less important than the cod, the haddock is one of the world's great food fishes. In the North Sea it constitutes nearly half the total catch. It makes about one sixth of the total New England catch by weight and by value. It is caught on the same grounds and in the same ways as the cod (*see* Fish; Fisheries).

Smoked haddock is known as *Finnan haddie.* The process of smoking the fish originated in the middle of the 18th century at Findon, a fishing village in Scotland. Originally the product was known as "Findon haddocks."

THE RETURN OF PERSEPHONE FROM HADES



In th s pa nt ng by S F ede k Le gh on He mes is gu d ng Persephone b de of P uto f om the Rea m of the Dead He mo he Deme er goddess of agr u ture we comes he joyful y Now sp ng w l come and Deme er w ll cause the ea th to b oom and bea f ut du ng the months he daugh e spends w th he befo e she has to e u n to Hades

HADES (*ha dez*) When the three g eatest gods of Creek mythology so the story goes d vided the world a nong themselves Zeus obtained dom n on over the heavens and upper reg ons Pose don became ruler of the sea while Hades ga ned sovere gnty over the underv orld Here in the realm of darkness Hades sat enthrone l with his wife Persepl one and ruled the sp rits of the dead He possessed a helmet which rendered him invisible The Greeks p ctured him as of stern and gloomy aspect not to be moved by prayers and flattery No temples were dedicated to him and when sacrifices were offered to him the ceremonies were dismal and only black an mals were used

So hated and feared was Hades as the god of the dead that the Greeks dreaded to call him by h s real name In later times they gave him a more k ndly character and called him Pluto giver of wealth for they believed that he controlled all the precious minerals that lay h dden in the depths of the earth and even the gra n that spr ngs forth from the ground

The term Hades came to be appl ed also to the abode of the dead This was gen erally thought of as a place where the souls of the good and tl e evil al ke led a dim shadovy existence though there also grew up the idea of Elys um or the Elysian F elds a parad se for those deserv ng special reward and Tartarus a deep pit under Hades where the wicked dwelt in eternal torment Before pass ng into Elys um souls drank of the waters of Lethe the river of oblivion that they might forget the r sorrows

To enter Hades the dead ere ferr ed across the River Styx by the boatman Charon Only tho e who had received proper burial were allowed to go across and if a body remained unburied the shade must wander on the bank for a hundred years before cro s ng On the farther side of the Styx stood the many headed dog Cerberus guar lian of Hades portals who kept any who entered from returning

HAGUE (*hag* THE The third largest city of the Netherlands and its govern mental center The Hague *lies in South Holland* about two m les from the North Sea It has been the seat of the legislature and the H gh Court s nce the 16th century But Amsterdam is consi lered to be the cap tal (*hoofdstad* or head c ty) because the const tut on requires that the king or queen be crowned there

The Hague is normally the royal res dence and it was for long the d plomat c cap tal of Europe S nce 1899 it has been the seat of the international court of arb trat on or Hague Tr bunal for which Andrew Carnegie bu lt a splendid palace

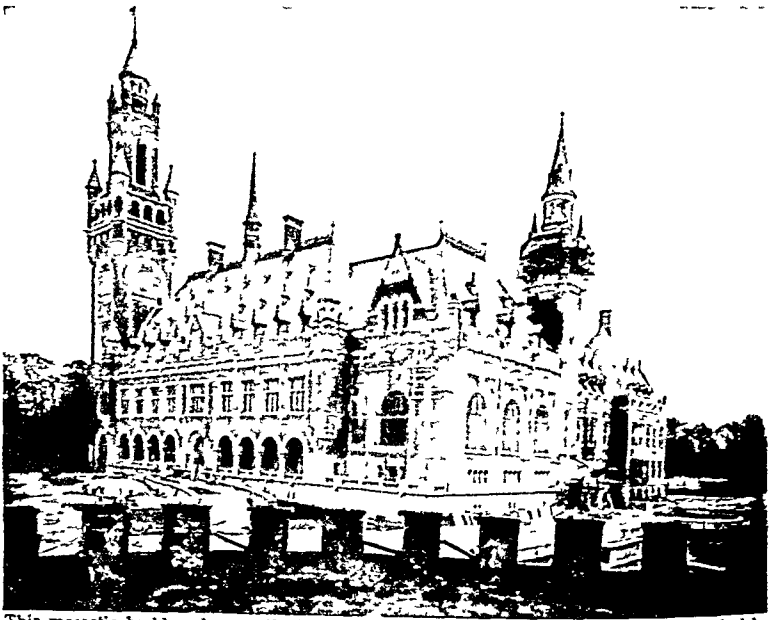
The original Dutch name of the city was s Grav enhage (the count s forest) which is shortened to den Haag The name comes from the fact that long ago tl e counts of Holland had a hunt ng preserve there The city was once in a heavy wood Only a l ttle patch is left between The Hague and Scheveningen the country s popular seaside resort

Broad shaded streets, intersected by many picturesque canals, and fine old buildings make the city one of the most attractive in all Europe. Its greatest pride is in its celebrated picture gallery, the Mauritshuis, which has many beautiful and world-famous pictures. Here are masterpieces by the Dutch and Flemish artists Rembrandt, Rubens, Van Dyck, Vermeer, and others. There is also a fine gallery of modern paintings collected by the Dutch painter Hendrik Willem Mesdag. Population (1947 census), 532,998.

HAGUE PEACE CONFERENCES. Before the first World War, the most promising movements for world peace were two conferences which met at The Hague in 1899 and 1907, on the call of the czar of Russia. Twenty-six countries, including the United States, attended the first, and almost twice that number were represented at the second meeting.

The chief objects of the conferences were to secure an agreement for the reduction or limitation of national armaments, and to formulate a plan for settling international disputes by arbitration instead of war. None of the great powers, except the United States and Great Britain, was especially eager to limit its armaments; the German delegation refused to consider any such scheme. The first object of the conferences, therefore, was not attained.

HISTORIC PEACE PALACE AT THE HAGUE



This majestic building houses the International Court of Justice, which was established by the United Nations in 1945. It was built earlier for the Permanent Court of Arbitration and later it housed the Permanent Court of International Justice (the "World Court").

The Hague Conventions

The conferences proposed 13 agreements or "conventions" concerning international disputes. Included were regulations which defined the rights of neutral nations and outlawed such military tactics as naval bombardment of undefended towns, and the use of poison gas and aerial bombs. Since none of these agreements was ratified by all the powers concerned, they were not considered binding. Most of their provisions were disregarded in the first and second World Wars.

The conferences also drafted a plan for optional arbitration which led to the Permanent Court of Arbitration (the "Hague Court"). This consisted of a panel of judges from the member states. When two nations quarreled, as over a boundary line, they could request a judge to arbitrate the dispute (*see* Arbitration). When the League of Nations established the Permanent Court of International Justice (the "World Court") in 1920, the older Hague Court nominated candidates to the World Court bench. Under the United Nations charter, the two older courts were virtually merged into the new International Court of Justice.

HAIL. The rolling white squall cloud that you sometimes see at the beginning of a thunderstorm is a "hail factory." The air in it is whirling along a line parallel to the earth. If a raindrop is caught and carried up high enough it turns to snow. When it comes down it is coated with water; on rising again, it freezes. The longer it travels the larger it gets; each coat freezes in turn until the mass of ice is so heavy that it falls to the earth in the form of hail. The more violent the whirl, the larger the hailstone will be before it falls. Some have been seen as large as eggs and there are records of storms in which hail covered the ground to the depth of a foot. Great destruction sometimes attends such storms, animals and even men being killed.

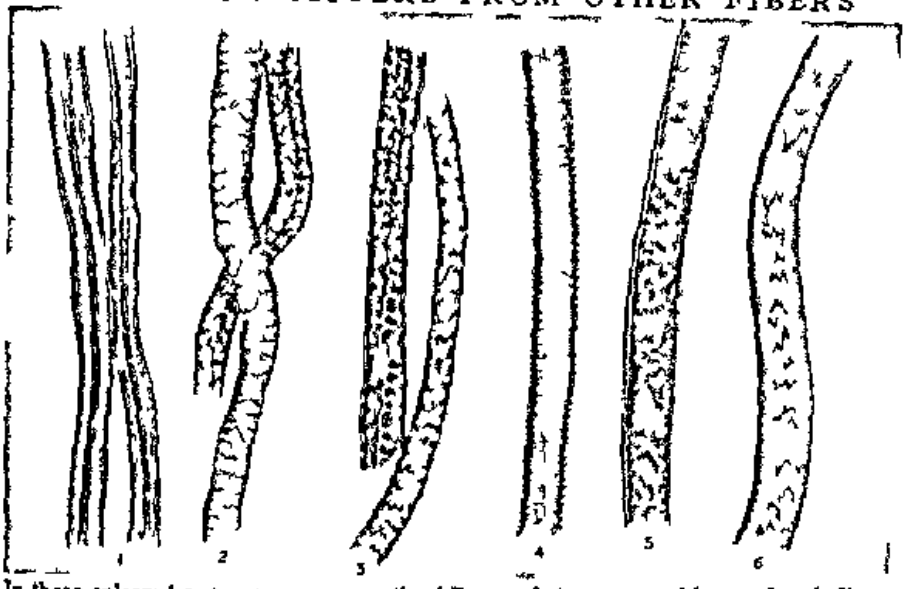
Frozen rain is sometimes called hail when it should properly be termed "sleet." Soft hail which sometimes falls in winter is merely a form of snow. Real hail is always a part of a thunderstorm, and therefore is most likely to occur on hot summer afternoons.

HAIR. Any animal which has hair is a mammal. Such animals also have backbones and suckle their young. No other animals have hair. The amount of hair and where it grows is quite different on different kinds of mammals. On such animals as dogs, sheep, cattle, and horses the hair covers the entire body in a thick coat of fur. On such mammals as the whale or hippopotamus only a few hairs are found. Animals which live in cold regions usually grow heavier coats of fur than those which live in warm or hot climates. Many animals grow thicker coats of fur in the winter than in the summer. Hair is not always soft and long. In hogs the hairs are stiff bristles; in the porcupine

and hedgehog they are enlarged and toughened so that they form a protective coat of spines or quills

In human beings no hair is found on the palms of the hands or on the soles of the feet There are about 1 000 hairs to the square inch on the scalp or 120 000 hairs on the whole head The hair of humans is constantly being shed and replaced with new growth

HOW HAIR DIFFERS FROM OTHER FIBERS



In these enlarged pictures you can see the difference between animal hair and such fibers as silk (1) which can be woven into smooth soft fabrics Wool (2) is typical of animal hair with a rough scaly surface Rabbit hair (3) also has large scales Human hair (4) possesses a fine scale while camel hair (5) and horse hair (6) have an almost horny surface It is because of the scales which interlock and cling together that many kinds of animal hair can be matted into felt

Each eyelash lasts about 150 days other hair may last up to four years Most animals have shedding periods when their hair is replaced by new

Each hair grows from a tubular follicle or sheath in the skin called a root. A blood vessel feeds it and carries away the waste Glands provide oil to keep it moist and soft Nerves control the blood vessel and a muscle the hair erector By contracting the muscle makes the hair bristle or stand on end Like the hair on the tail of an angry or frightened cat

Each hair is a strong flexible elastic thread composed of many horny cells Some hairs are straight others wavy and still others frizzy or woolly (For illustration in color of a cross section of skin showing hair root *see* Microscope) Microscopic examination of the cut end of a straight hair shows that it is round while a curly hair is elliptical in cross section Scientists have used these differences in human hair as a basis for classifying mankind into the straight-haired the wavy haired and the woolly haired races Straight-haired people include the Mongoloids such as the Chinese and other yellow skinned people and the North American Indians the wavy haired group is the white or Caucasian race and the woolly haired peoples are the Negroes

The color of hair is due to a pigment in the cells This is lacking in white hair The hair of the straight-haired woolly-haired and frizzy haired peoples is usually black the varying shades of brown or yellow are found only among the wavy haired peoples Red hair occurs regardless of hair type or race

Straight hair grows longer than the wavy type woolly hair is shorter Wavy hair on a man if left uncut may grow somewhat more than a foot long a woman's hair will usually grow to twice that length although growths six feet long or more have been known Among straight haired and woolly haired peoples the sexes have about the same length of hair

Baldness or *alopecia* of the common type has a characteristic pattern of development It starts in the hair line above each eye or at the top of the head These areas gradually increase and may join into one large bald area with hair around the edges The cause is not known but it is probably hereditary Common baldness occurs more frequently in men than in women. It is also more frequently found *in people with wavy hair than* with straight or woolly hair No successful treatment for common baldness is known. Dandruff which is loose scales of dead cells and dried oil secreted by glands is a normal physical process Some people have more dandruff than others The best treatment consists of massage brushing the hair to remove dandruff and frequent shampoos

Other types of baldness show a rather sudden loss of hair in patches or over the whole head These types may result from high fevers glandular disturbances or emotional experiences Usually the hair regrows without treatment when health is restored The relationship between *seborrhea* which is an excessive secretion of sebum (oil) by the sebaceous glands and baldness is not certain Seborrhea is not limited to the scalp It may occur any place on the body

Economic Uses of Hair

The hair of many animals is of economic importance Cloth is made from the hair of the sheep goat camel vicuna and other animals Felt for hats is made from the hair of rabbits and hares Cow hair obtained usually when the animal is killed for food is used in making mortar and for certain coarse cloths The hair of horses tails and manes is made into fishline and horsehair cloth used for upholstery or stiffening garments Hair from camels badgers and sable is used in artists brushes Pig bristles are made into many kinds of brushes including toothbrushes Human hair is used for wigs and for hair nets Artificial fibers such as nylon are now being used in place of animal hair

HAITI—*America's Only* NEGRO REPUBLIC



Ornate Gateway Leads to City Market in Port au Prince, Haiti's Capital

HAITI (*hā'tĭ*), REPUBLIC OF. Late in the year 1803 the remnant of a French army which had been crushed by a desperate force of Haitian Negroes sailed silently away from Cap Haïtien. The rule of France over Haiti was broken, and at last that beautiful land belonged to the Negroes who had been brought in as slaves by the French to work on its rich plantations. But these people, poor and uneducated, were ill-fitted for self-government. For more than a century revolution followed revolution, until in 1915 the struggling nation—one of the two Negro republics in the world—became a ward of the United States.

This land of vivid beauty and tragic history occupies the western third of Hispaniola, the rugged island that lies between Cuba and Puerto Rico, about 20° north of the equator. The rest of Hispaniola is occupied by the Dominican Republic (*see* Dominican Republic). Haiti thrusts up from the sea like a many-towered citadel. Mountains cover two-thirds of its area, which is about that of Vermont. Green and white coral reefs color the sparkling bays.

The mountains, many of them towering more than 7,000 feet, and the trade winds cause the amount of rainfall to vary greatly in different regions. Some regions, notably the central plain, are semiarid, but many of the valleys and alluvial plains are so well watered and fertile that Haiti has been called "the black man's paradise." In the rainy season heavy storms on the mountains flood the many short rivers, of which the most important is the Artibonite. The climate is tropical in the lowlands, but in the high mountains the winter temperature sometimes falls below 50 degrees. Haiti has no large animals, but pelicans, flamingos, egrets, and partridge are numerous, and the rivers and bays abound in crabs, oysters, and brilliant-colored tropical fishes.

Haiti's People and Industries

Except for a relatively small number of mulattoes, who control the government, the native population is pure Negro—descendants of African slaves. Illiteracy and the fatalism that numbs a people after long oppression have kept them in an almost primitive state. While revolutions tore the country, they raised scarcely more than was needed for their own use and there was little trade. Even today, though agriculture is encouraged and roads are being built to promote trade between towns, the peasants remain small farmers.

Since little effort has been made to irrigate the drier regions, the peasants are crowded into the valleys and alluvial plains, in some places with more than 300 persons to the square mile. Many own their tiny plots of land, others rent from the state. Their homes are squat mud huts with palm-thatched roofs. With machetes and axes, they cultivate their little food crops of sugar cane, corn, beans, and manioc root for cassava flour. Abundant fruit trees—including the

banana coconut orange avocado mango and bread fruit—thrive with little care in the fertile soil

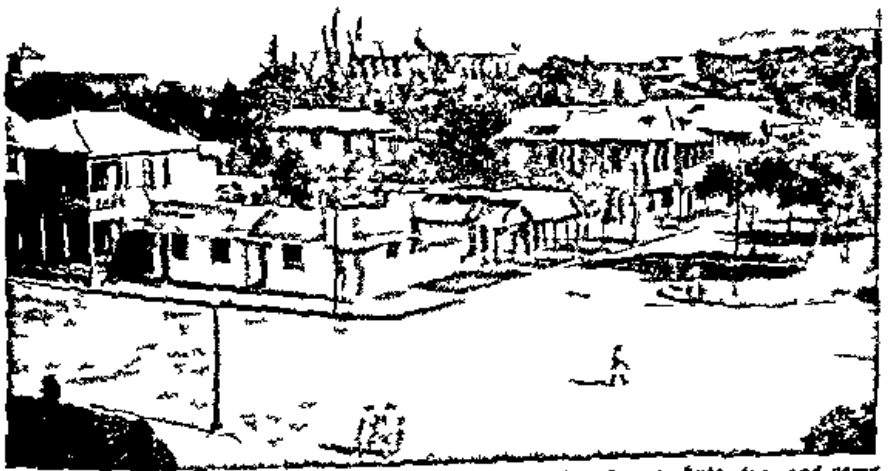
The Haitians are a picturesque people fond of bright color and music and dancing The chief religion is the Roman Catholic but many upland peasants still practise African voodooism Although Haiti's official language is French the peasants speak a Creole patois Education is free through all the grades

For many years Haiti exported only logwood and coffee which grows wild on the mountain slopes With the establishment of law and order however sugar cotton and sisal plantations have been encouraged These products with pineapples and bananas are now valuable exports Coffee however is still far in the lead with France as the chief customer Mineral development has been negligible although small deposits of iron and copper have been found with traces of gold silver lead and zinc Some salt is exported Haiti's once thick forests of logwood cedar and other valuable timber are largely depleted

The chief cities are Port au Prince the capital and Aux Cayes and Cap Haitien Port au Prince built on the fertile alluvial plain known as the Cul de Sac faces one of the most beautiful bays in the world—an arm of the great Gulf of Gonaives which deeply indents Haiti on the west Aux Cayes lies on the southern coast and Cap Haitien on the northern coast

OLD AND MODERN WAYS LIVE SIDE BY SIDE





In the interior of Haiti Negro natives live in African mud and grass huts (top) and carry baskets on their heads as their ancestors did In coast cities (Port au Prince bottom) and other seacoast cities have modern West Indian adaptations of French architecture

Haiti's Bitter History

The island has had a turbulent history ever since its discovery by Columbus in 1492 It was then inhabited by Arawak Indians who called it Quisqueya Haiti was their word for mountainous Columbus named the island La Isla Española which later became latinized to Hispaniola Little Spain He established a Spanish settlement La Navidad (The Nativity) near the present town of Cap Haitien and Haiti thus became the first part of the New World to be colonized by Europeans Forced by the Spaniards to oppressive labor the Indian population soon perished (*see* Las Casas) In 1510 the Spaniards began importing African slaves In 1697 Spain was forced to cede (Treaty of Ryswick) the western or Haitian part of the island to the French who developed vast sugar plantations and made Haiti their richest colony

After many futile insurrections the Negroes united in 1798 under Toussaint L Ouverture a freed slave Toussaint captured by trickery died in a French prison but his successor Jean Jacques Dessalines The Tiger drove out the French late in 1803 In 1804 Dessalines proclaimed the colony's independence and massacred almost all the remaining white inhabitants The great plantations sugar mills irrigation works and roads fell into ruins In 1806 Dessalines was assassinated His general in chief Henri Christophe succeeded him Declaring himself emperor Christophe attempted to reconstruct the ravaged country His ornate palace of Sans Souci near Cap Haitien and his vast citadel though now in ruins, are marvels of massive masonry After Christophe's suicide a succession of military despots seized power

By 1915 revolutions and banditry had reduced Haiti to a miserable condition, and it was in debt to European interests. The United States, under its Monroe Doctrine, felt obliged to intervene and administer the finances under a treaty with Haiti.

Roads, bridges, public buildings, and hospitals were built. The city streets were paved, and sanitary laws enforced. Lighthouses were improved, and a coast guard and well-trained police force were organized. Rural clinics brought medical care to the disease-ridden peasants. Haitians were trained as doctors, nurses, and executives.

Despite improved conditions, the people resented American occupation. In 1930 the first elections in 12 years brought in a solidly anti-American Parliament. The occupation force was withdrawn in 1934. In 1937 a border dispute with the Dominican Republic cost many Haitian lives. Area, 10,200 square miles; population (1950 census), 3,111,973.

HAKE. Fish of the hake family (*Merlucciidae*) are found in many parts of the world. They have two back fins, the second much longer than the first. The long ventral fin seems to serve as a feeler as the fish moves over the sea bottom in search of food. Hakes are reddish or olive-brown above, white or yellowish below and on the sides of the head.

White hake (*Urophycis tenuis*) is one of the most important food fishes landed in the New England states. It is 16 to 18 inches long and weighs 5 to 8 pounds and a maximum of 30 pounds. Red, or squirrel, hake (*Urophycis chuss*) is used chiefly for oil and fish meal. It is smaller, averaging 2 to 5 pounds Closely related are whiting, or silver hake (*Merluccius bilinearis*), of the Atlantic coast and Pacific hake (*Merluccius productus*) of the West coast.

HAKLUYT, RICHARD (1552?–1616). In the days when England was first winning glory at sea, Richard Hakluyt began setting down the record of his country's achievements. This quiet-living clergyman spent much of his lifetime, during the latter years of Queen Elizabeth I and the reign of James I, gathering accounts of the great voyages of the time. The result gave history an immensely rich mine of information about the stirring deeds in this great age of discovery.

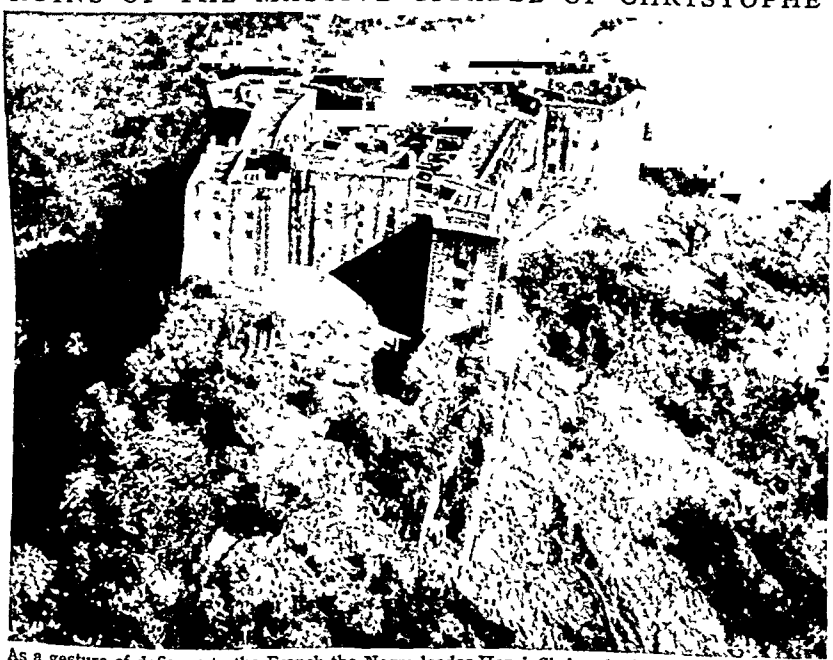
Richard Hakluyt was born in London about 1552 He attended school in Westminster. His cousin introduced him to "certain bookes of cosmographie" and "an universall map." Thereupon young Hakluyt determined to become a student of geography. In 1570 he entered Oxford University. There he began collecting books and manuscripts dealing with explorations and voyages to distant places. He read everything he could find in Greek, Latin, Italian, Spanish, Portuguese, French, and English. After completing his studies at Oxford he remained there for several years to lecture on geography.

Like many university graduates of his day, Hakluyt became a clergyman and received an income from the church. His first book, 'Divers Voyages touching the Discoverie of America', published in 1582, brought him to the attention of the Queen's court He was introduced to sea captains, merchants, and mariners who gave him first-hand accounts of English voyages.

In 1583 he became chaplain to the English ambassador at Paris. During the next five years he collected information about Spanish, Portuguese, and French explorations. In 1584 he wrote 'A particular Discourse concerning Western Discoveries'. The book contained an urgent appeal to Englishmen to establish colonies in America.

Upon his return to England, he published his chief work, 'The Principall Navigations, Voiages and Discoveries of the English Nation' (1589), later revised and enlarged. Hakluyt was a promoter of the Virginia Company of London which began the settlement of Virginia.

RUINS OF THE MASSIVE CITADEL OF CHRISTOPHE



As a gesture of defiance to the French the Negro leader Henri Christophe built this huge fortress on the almost inaccessible summit of Bishop's Bonnet Mountain. All the building material and heavy cannon were hauled to the top by hand. The fortress had barracks for 10,000 troops.

HALE EDWARD EVERETT (1822-1909) His interest in good causes influenced almost all the writings of Edward Everett Hale His best-known story The Man Without a Country published in the *Atlantic Monthly* during the Civil War was written to build up a just and true national sentiment The story's hero Philip Nolan has come to symbolize a man who learns too late to love his country

Hale was born April 3 1822 in Boston His father was Nathan Hale nephew of the Revolutionary War hero of the same name The father was editor of the *Boston Daily Advertiser* Edward's mother was Sarah Everett Hale sister of Edward Everett orator clergyman and diplomat She was herself a writer

Hale was thus reared in an atmosphere of intellectual activity He attended Boston Latin School and entered Harvard College when he was only 13 years old During his student days he reported meetings of the Massachusetts legislature for his father's paper

After his graduation from Harvard in 1839 Hale taught at the Boston Latin School while he studied for the Unitarian ministry He began to preach before his ordination (1846) as minister of the Church of Unity in Worcester Mass where he remained ten years His only other pastorate was of the South Congregational Church in Boston He was married in 1852 he had one daughter and seven sons

Hale's interest in bettering social conditions led him to take an active part in making Kansas a free state During the Civil War he was a leader of the Sanitary Commission an organization that served much as does the Red Cross today Over the years he wrote for several magazines and edited a religious journal Of all his books he thought *In His Name* (1873) his best but his New England Boyhood (1893) was more popular Among his best-known works are James Russell Lowell and His Friends (1899) and Memories of a Hundred Years (2 vols 1902)

In 1894 Hale feeling himself too old for parish work resigned his pastorate From 1903 until his death in Boston June 10 1909 he served as chaplain of the United States Senate

HALE NATHAN (1755-1776) During the American Revolution when taken by the British and condemned to hang as a spy Nathan Hale said I only regret I have but one life to lose for my country His words symbolize the spirit of patriotism to all Americans

Nathan Hale was one of 12 children nine boys and three girls He was born on a farm at Coventry Conn June 6 1755 His father Richard Hale was a prosperous farmer and church deacon When not busy with chores or study Nathan liked to fish wrestle and swim His study under a village minister prepared him to enter Yale College when he was 14 years old There he studied hard played football joined a literary fraternity and engaged in political discussions One of the plays he probably read at Yale was Addison's Cato His last words paraphrased a speech made by a character in that play

After his graduation in 1773 Nathan taught school at East Haddam Conn In the spring of 1774 he began teaching at New London Conn He was admired for his learning his athletic prowess and for maintaining school discipline without being severe

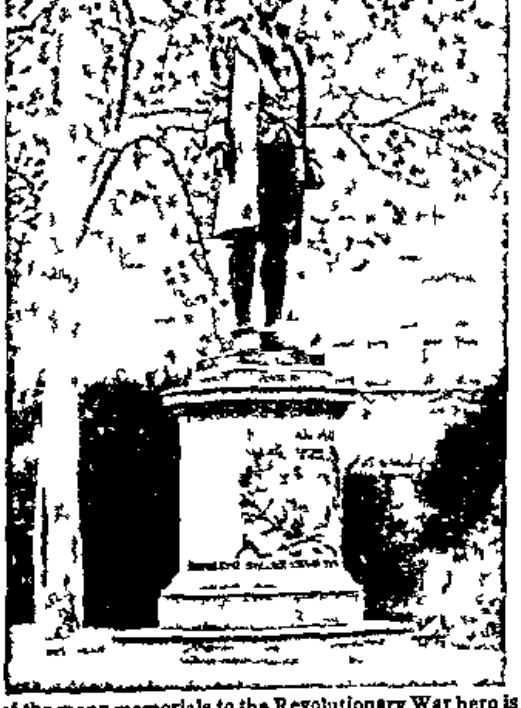
When news of the British American clash at Lexington Mass arrived at New London the tall light haired blue-eyed teacher made a stirring speech urging enlistment in the patriot army On July 1 1775 he was commissioned a first lieutenant

He first served at the siege of the British in Boston On Jan 1 1776 he was promoted to captain When the British evacuated Boston Washington moved his army to New York City After his defeat in the battle of Long Island Washington needed to know the disposition of the British forces Captain Nathan Hale volunteered to spy them out

Dressed in civilian clothes he crossed to Long Island from Norwalk Conn As he secured the needed information the British landed in New York City and drove Washington's army to Harlem On the night of September 21 as Nathan Hale tried to regain the American lines he was captured

Taken before General Howe and faced with the notes and maps he had concealed on his person Nathan Hale admitted his rank and purpose Howe ordered his execution The next morning while awaiting summons to the gallows Hale was invited by British Capt John Montresor to spend his remaining time in the captain's tent Hale accepted and while there wrote two letters they were probably later destroyed by the British Nathan Hale mounted the gallows at eleven o'clock Sept 22 1776 uttered his famous

NATHAN HALE



One of the many memorials to the Revolutionary War hero is this *statue* by Frederick MacMonnies It was erected in City Hall Park New York City A copy of the statue stands in Chicago

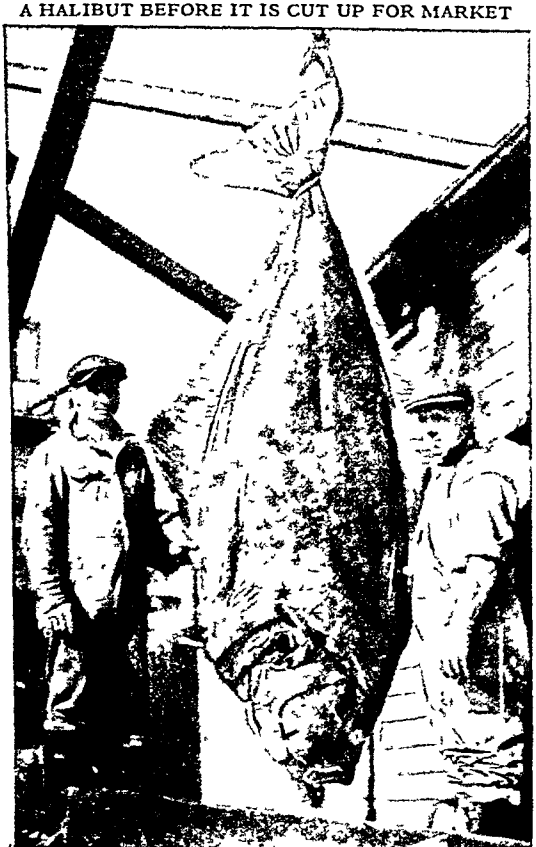
words, and was hanged. News of his death and of his last words were given American officers by Captain Montresor under a flag of truce. (*See also* Revolution, American.)

HALIBUT. One of the commonest fish on the menu is the halibut. Yet it is probable that many persons who eat a halibut steak have no idea of the great size of the fish, for a whole halibut is seldom displayed in the market. Halibut caught for market are commonly from 3 to 5 feet long and weigh from 30 to 100 pounds. Some weigh 200 or 300 pounds, and specimens more than 9 feet long and weighing more than 600 pounds have been caught. The female is larger than the male, which rarely weighs more than 60 pounds.

The halibut is the giant of the flatfish family (*see* Flatfish). It differs slightly in shape from its relatives the flounder, sole, and turbot in having a thicker and more elongated body. It lives in the cold waters of the Pacific and Atlantic on banks extending from shore to a depth of about 1,500 feet. Its southern limit in the Pacific is San Francisco, and in the Atlantic, New York City and Havre, France.

In one season, a large female lays more than a million eggs, each about one eighth of an inch in diameter. The larva swims upright and has an eye on each side of the head. Soon, however, the young fish swims on its left side, and the left eye migrates to the right side of the head, where both eyes remain, leaving the left side blind. The right side of the adult is brown, and the left side is pale, almost colorless. The halibut sometimes buries itself in sand to hide from its enemies, the shark and the seal, or to lie in wait for prey. It feeds on mollusks and crustaceans, crunching them with strong teeth set in powerful jaws. It also eats skate, cod, menhaden, and mackerel. With a flip of its tail, it can stun a large codfish, which it then devours.

A HALIBUT BEFORE IT IS CUT UP FOR MARKET



This 325-pound halibut was landed at Seattle, Wash., by the halibut schooner 'Yakutat'. Halibut are caught with hooks attached to long lines at intervals of about 13 feet.

In addition to the importance of halibut as food, oil, rich in vitamins A and D, is extracted from its liver and viscera. The world's most important halibut fishery extends 2,000 miles along the Pacific coast of North America, from northern California to the Bering Sea. These fishing waters are notable for conservation of a natural resource through wise management. They are regulated by the United States and Canada through the International Fisheries Commission. Halibut are also caught in Japanese waters and in the Atlantic off the coast of Canada and northern United States. The catch near Iceland, Greenland, and Norway is also important.

The scientific name of the common halibut is *Hippoglossus hippoglossus;* of the arrow-toothed halibut, *Atheresthes stomias;* of the Greenland halibut, *Rheinhardtius hippoglossoides.* The arrow-toothed halibut ranges in the Pacific from San Francisco to Alaska; the Greenland halibut, from the Arctic parts of the Atlantic south to Finland and Grand Banks.

HALIFAX, NOVA SCOTIA. Rudyard Kipling gave the name "Warden of the North" to Halifax, capital of Nova Scotia, because it is the most strongly fortified position and the chief naval station of the British Commonwealth in North America. It has held this position almost from its founding in 1749.

When the British troops were driven out of Boston in 1776, they sailed to Halifax to reorganize. In the War of 1812 it was the base of operations for British privateers, and in the American Civil War it was an important base for Confederate blockade runners. Many United States and Canadian troops sailed from Halifax during the first World War. In 1917, after a collision in the harbor, a munitions ship exploded, killing more than 2,000 people and razing the city's north side. Throughout the second World War it was one of the chief bases for sending supplies from Canada to England. To protect the convoys from enemy submarines, a steel net was installed in the harbor.

One reason why Halifax is so important is that it is 600 miles, or about a day's travel, nearer Liverpool than New York City is. It is also nearer to some South American and South African ports than are several other northern ports of North America.

Its favorable position and its magnificent harbor, open the year around, make Halifax a great commercial center. To improve the shipping facilities, the

Canadian government has spent $30 000 000 and has built huge terminals where transcontinental trains can run alongside the great Atlantic liners

Manufactures of importance have also grown up Raw sugar brought in from the West Indies is refined in the largest refinery in Canada There is a large oil refinery and foundries and machine shops make and repair equipment used by the great transportation companies Population (1951 census) 85 589

HALL, CHARLES MARTIN (1863–1914) On the morning of Feb 23, 1886 a young man of 22 stood anxiously over a complicated mass of electric wires crucibles and heating apparatus in a woodshed in Oberlin Ohio For two hours Charles Martin Hall watched as the contents of one of the crucibles grew hotter and hotter Finally he turned off the powerful current and shaking with excitement poured out the molten mass A number of little silver colored drops had separated and they quickly hardened into shining buttons of metal Catching up the globules Hall ran to the near by campus of Oberlin College Bursting into the office of his friend and adviser Prof F F Jewett he cried 'Professor I've got it!'

CHARLES MARTIN HALL



His discovery of a cheap process for making aluminum is the basis of a giant industry

This incident was the foundation of one of our greatest modern industries for Hall had discovered a cheap process of separating aluminum from its oxide Pure aluminum oxide was abundant and cheap To melt it by electrolysis required a temperature of 2 050° C Hall's problem was to find a substance which melts at a lower temperature and when melted dissolves aluminum oxide He found his solvent in cryolite (*see* Aluminum)

Hall's Early Life

Charles Martin Hall was born at Thompson Ohio Dec 6 1863 His father was a Congregational minister who later took his family to Oberlin to live Charles's absorbing interest in chemistry began when he found an old book on the subject in his father's library Even before he entered college young Hall was interested in the extraction of aluminum and set himself to find a process which would be commercially profitable At college he conducted experiments to this end and eight months after graduation he made his epochal discovery

The date is important for in April of the same year a young Frenchman Paul Louis Toussaint Héroult was granted a French patent for the same process Hall applied to the United States Patent Office in July 1886 for a patent on his discovery but it was not granted until 1889

Meanwhile Hall had all the difficulties usually encountered by inventors Manufacturers at first were not interested When at length the Mellon interests gave him financial backing and successful manufacture was under way another manufacturer brought a lawsuit accusing Hall of having stolen the Héroult process But he was cleared of the charge in 1893 and then made a fortune from his invention

The success of the Hall Héroult process has made the cost of a pound of aluminum a matter of cents instead of dollars so that we have kitchen pots and pans and hundreds of other common articles made of this metal

HALL OF FAME On University Heights in New York City overlooking the Hudson and Harlem river valleys stands the Hall of Fame for Great Americans It is a granite colonnade 630 feet long which follows the curve of the terrace on which rest several of the buildings of New York University In the colonnade are panels for 100 bronze tablets each to bear the name of the person commemorated the dates of his birth and death and an appropriate inscription Dr Henry M MacCracken, a former chancellor of the university, originated the idea of the Hall of Fame According to conditions made in 1900 by Helen Gould Shepard who gave funds for the memo-

NAMES IN THE HALL OF FAME

CHOSEN IN 1900

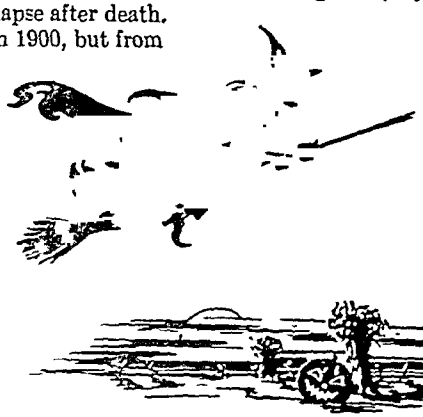
George Washington
Abraham Lincoln
Daniel Webster
Benjamin Franklin
Ulysses S Grant
John Marshall
Thomas Jefferson
Ralph Waldo Emerson
Henry Wadsworth Longfellow
Robert Fulton
Washington Irving
Jonathan Edwards
Samuel F B Morse
David Glasgow Farragut
Henry Clay
Nathaniel Hawthorne
George Peabody
Robert E Lee
Peter Cooper
Eli Whitney
John James Audubon
Horace Mann
Henry Ward Beecher
James Kent
Joseph Story
John Adams
William Ellery Channing
Gilbert Stuart
Asa Gray

NAMES SUBSEQUENTLY ADDED

James Russell Lowell
John Greenleaf Whittier
John Quincy Adams
James Madison
Alexander Hamilton
William T Sherman
Louis Agassiz
Maria Mitchell
Emma Willard
Mary Lyon
Harriet Beecher Stowe
Oliver Wendell Holmes
Edgar Allan Poe
James Fenimore Cooper
Phillips Brooks
William Cullen Bryant
Frances E Willard
Andrew Jackson
George Bancroft
John Lothrop Motley
Matthew Fontaine Maury
Grover Cleveland
Mark Hopkins
Francis Parkman
Elias Howe
Joseph Henry
Charlotte Cushman
Rufus Choate
Daniel Boone
Samuel L Clemens
Augustus Saint Gaudens
James Buchanan Eads
Patrick Henry
William T G Morton
Roger Williams
Alice Freeman Palmer
Edwin Booth
John Paul Jones
Walt Whitman
James Monroe
James McNeill Whistler
Simon Newcomb
William Penn
Stephen Foster
Booker T Washington
Thomas Paine
Walter Reed
Sidney Lanier
William C Gorgas
Woodrow Wilson
Susan B Anthony
Alexander Graham Bell
Theodore Roosevelt
Josiah Willard Gibbs

rial to the American people, only persons who had been dead 10 years or more were eligible to be so honored. In 1922 it was decided to extend to 25 years the minimum time that must elapse after death.

Fifty names were to be inscribed in 1900, but from more than 1,000 nominations, only 29 were elected. Five names were to be added every fifth year thereafter until all the panels have been filled. A later ruling provided that if five names are not selected at an election, up to seven names may be chosen at the next election. All names in the Hall of Fame are listed on the preceding page.



The public makes nominations to the senate of New York University. Names seconded by the senate and those who received 20 or more votes in a previous election are submitted to approximately 100 electors, who vote upon them subject to senate approval. Sixteen classes of citizens are recommended for consideration, including statesmen, authors, artists, scientists, educators, physicians, businessmen, inventors, explorers, philanthropists, and others. Foreign-born Americans have been eligible since 1914. Also in 1914, a colonnade site was set apart as a Hall of Fame for Women, but in 1922, after seven names had been chosen, it was decided to include the names of the women with those of the men.

HALLOWE'EN. Customs and superstitions gathered through the ages go into our celebration of Hallowe'en, or "Holy Eve," on October 31. The day is so named because it is the eve of the festival of All Saints, but many of the beliefs and observances connected with it arose long before the Christian era, in the autumn festivals of pagan peoples.

The ancient Druids had a three-day celebration at the beginning of November. On the eve before, they believed, spirits of the dead roamed abroad, and they lighted bonfires to drive them away. In ancient Rome the festival of Pomona, goddess of fruits and gardens, occurred at about this time of year. It was an occasion of rejoicing associated with the harvest; and nuts and apples, as symbols of the winter store of fruit, were roasted before huge bonfires.

Even after November 1 became a Christian feast day, honoring all saints, the peasants clung to the old pagan beliefs and customs that had grown up about Hallowe'en. It became a night of mystery and fun-making, with many picturesque superstitions. Folk came to believe that they could foretell the future on that night by performing such rites as jumping over lighted candles. In the British Isles great bonfires blazed and laughing bands of "guisers," young people disguised in grotesque masks and carrying lanterns carved from turnips, gathered in each village. Their rollicking fun and cherished superstitions are described in Robert Burns's famous poem 'Hallowe'en'.



Our Hallowe'en celebrations today keep many of these early customs unchanged. Young and old still gather to hunt nuts and to duck for apples bobbing in a tub of water. Grinning pumpkin jack-o'-lanterns, rustling cornstalks, and white-sheeted figures create an air of mystery, and black paper witches and cats are used for party decorations.

Hallowe'en is a favorite "special day" for school celebrations, when young people hold costume parties, play old-fashioned games, and give clever plays and pageants based on the ancient customs. Frequently whole communities gather for a Hallowe'en festival, as did the villagers of earlier days.



BIBLIOGRAPHY FOR HALLOWE'EN

Big Book of Halloween Entertainments (Berkley, 1944).

Harper, Wilhelmina. Ghosts and Goblins: Stories for Hallowe'en (Dutton, 1936).

Linton, Ralph and A. S. Hallowe'en Through Twenty Centuries (Schuman, 1950).

Nathan, Robert. Innocent Eve (Knopf, 1951).

Schauffler, R. H., ed. Days We Celebrate (Vol. 4, pp. 221-301) (Dodd, 1940).

Schauffler, R. H., ed. Hallowe'en (Dodd, 1933).

Sechrist, E. H. Heigh-ho for Halloween! (Macrae Smith, 1948).

HALS (*hāls*), FRANS (*1580?–1666*). This Dutch painter, who is now recognized as one of the greatest portrait painters of all time, was almost forgotten and his work was ignored for two centuries after his death. So little was he esteemed that some of his paintings were sold for a few dollars, though lately a single work has brought as much as $350,000. Critics today put him next to Rembrandt at the head of the Dutch school, and some even call him the greatest of all painters for truth of character.

Frans Hals had a checkered life marked by the same bold contrasts of light and shade that are found in his work Though of an ancient patrician family the equal of the sturdy Haarlem burghers whose portraits he painted so profusely Hals found the rollicking life of tavern and street more to his taste Singers and jesters pot-girls and tavern heroes—these were his favorite subjects and he set them down on canvas with such an unquenchable humor and joy of living and so masterly a hand that no one can look at them without a responsive smile But the painter s love of tavern life reduced him to penury and near the close of his long life we find him so poor that he had to apply to the municipality for alms

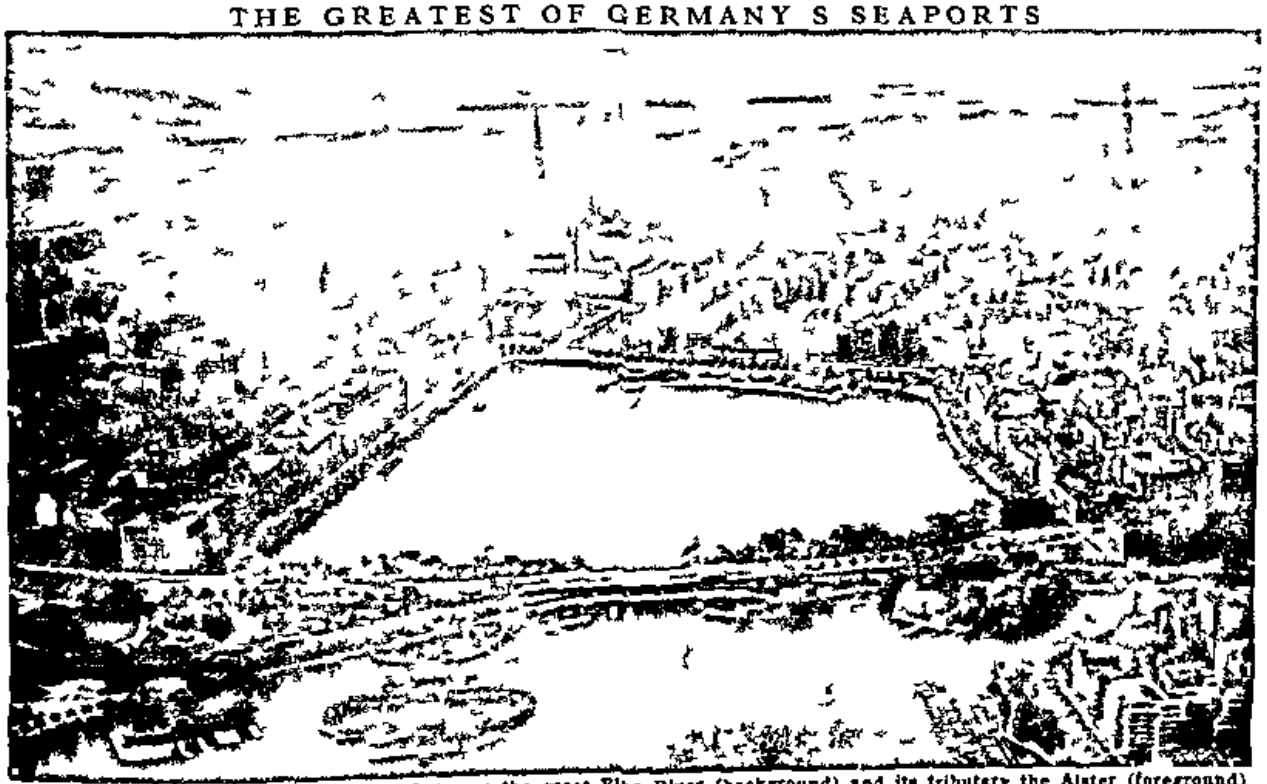
Born in Antwerp Hals moved to Haarlem in Holland when he was a young man In 1616 he began the first of the great series of shooting guild groups and public officials that show his genius particularly well In the Town Hall of Haarlem 84 ladies and gentlemen look down from the walls in eight great canvases The last of the series was painted in 1661 when Hals was 81 There on the walls may be traced the artist s development The picture painted in 1633 shows him at his most vigorous period when his brilliant color and quick grasp of *fleeting expression* were at their height The later groups are painted with great skill but the coloring has been toned down to somber gray tints Does the grayness of these last pictures reflect the sadness of the poverty-stricken painter s declining years? Some hold to this explanation others say that bright colors were so expensive that he had to use the cheaper black and white after *his days of plenty were over*

Many other examples of Hals s work are scattered throughout the world in public and private galleries The Fool a copy of which hangs in the Rijks museum in Amsterdam is considered by many to be the best character portrait ever painted 'Hille Bobbe an old woman with a half witted grin may be seen in the Royal Museum in Berlin His best-known work is The Laughing Cavalier in the Wallace Collection in London The original owner paid $400 for it Sir Richard Wallace paid $10 200 for it in 1865 and since then its value has increased greatly

HAMBURG GERMANY Located 75 miles inland from the North Sea on the Elbe River Hamburg has long been Germany s greatest harbor city It is situated so that it can serve the largest ocean liners and also send cargoes to the interior on barges The harbor was made by damming the Alster River a small tributary of the Elbe The old part of the city is a network of waterways which act as river roads between the warehouses and the main stream These canals give Hamburg the appearance of a commercial Venice, *with* sooty tugboats and barges replacing the picturesque gondolas (*see* Elbe River)

Hamburg was founded by Charlemagne who built a fortress there in 808 for protection against the Slavs In 811 he founded a church on the Elbe which was the beginning of the Christianization of northern Europe

THE GREATEST OF GERMANY S SEAPORTS



This aerial view shows how Hamburg lies between the great Elbe River (background) and its tributary the Alster (foreground) Engineers dammed the Alster to make Hamburg a *sheltered ice-free* harbor Before the second World War Hamburg often handled more tonnage than any other European seaport Notice how the dam divides the Alster into two lakes Binnen (inner) Alster and Aussen (Outer) Alster During the war Hamburg built a false harbor, but this camouflage failed to fool Allied planes They bombed the real harbor mercilessly *and destroyed* most of it as well as much of the surrounding city

Despite repeated pillaging and burning by the savage Danes and Slavs, the early Christians resolutely rebuilt the town and the church many times. It was made the seat of an archbishop in 834, and from then on it became the center of civilization in that part of the continent.

Its Troubled Years of Growth

The grant of fishing rights on the Elbe, and other franchises from Frederick I in the 12th century, started Hamburg's commercial life. Early in the 13th century, Lübeck and Hamburg formed the Hanseatic League and other towns soon joined the federation. In a short time, it had grown powerful enough to protect its land and sea trade from pirates and marauders (*see* Hanseatic League). In 1510 Hamburg was proclaimed a free imperial city by Maximilian I.

With these advantages, local and coastwise commerce flourished, and many Dutch and French refugee merchants were attracted there to share the city's prosperity. But ocean trade was jealously guarded by Spain, France, and England, and Hamburg was forced to take a minor part until avenues of commerce were opened up in the new world.

After Napoleon's victory in the battle of Lübeck in 1810, Hamburg was occupied by the French, and heavy taxation and looting ruined its trade. During the occupation years of 1813 and 1814, under the tyrannical rule of Gen. Louis Davout, its population shrank from 100,000 to 55,000.

In the years following, the city was rebuilt and commerce was revived, but it was again interrupted in 1842 by a fire which destroyed about one-third of the business section. Sanitary conditions were greatly improved in the rebuilding of the burned areas. The remains of the old ramparts along the shore of the Binnen Alster, the smaller of the city's two lakes, were beautifully landscaped, and the gay gardens and handsome buildings stood out sharply against the grime of the lower city.

With the advantage of a harbor that was ice-free the year round, and the finest of modern equipment, the port now grew to the peak of its importance. Its exports and imports were vast in variety and quantity, and the harbor was constantly teeming with activity. Among the city's many industries were shipbuilding, sugar refining, and the manufacture of chemicals, furniture, and flour. Railway systems ran into Hamburg from all sections of central Europe. Before the second World War, it had also become one of the centers of Europe's air traffic. Here too were established plants for refining oil and for building warplanes and submarines.

Destroyed by Air Raids, but Rebuilds

During the second World War the giant industrial city became one of the chief targets for Allied air raids. Mass bombings destroyed three fourths of the city, leaving it one of the most desolate in Europe. The population fell to less than half.

By 1952, however, Hamburg was making one of the swiftest recoveries among German cities. New factories arose in the shattered industrial districts. Makeshift bunkers and huts built of rubble were giving way to modern houses and apartment buildings. Ships of all nations again steamed into the rebuilt harbor. The refitted shipyards, the heart of Hamburg's great ocean commerce, clanged with work. In population, Hamburg had regained its prewar size. Population (1950 census), 1,605,606.

HAMILTON, ALEXANDER (1757–1804). Of all the men who aided in founding the republic of the United States and in framing and setting up the government under the Constitution, the most brilliant was Alexander Hamilton. In spite of his youth (he was not yet 20 when the war began) he was one of Washington's most trusted aides in the Revolution. As a lawyer he ranked among the foremost of his time. In the critical period of 1783–89 he won recognition as one of the soundest political thinkers of the day. In setting up the new federal government he had the chief part in translating the provisions of the Constitution into a strong, national governing system. It is not too much to call him one of the greatest statesmen in United States history.

Hamilton's history was as unusual as the man himself. Born in the island of Nevis, in the British West Indies, he inherited from his well-born Scottish father shrewdness and a logical mind, while from his gentle Huguenot mother he received the liveliness and charm characteristic of the French. He early displayed a talent for writing, and his vivid description of a West Indian hurricane, which appeared in one of the local papers, so impressed his friends that they raised money and sent him to America to complete his education.

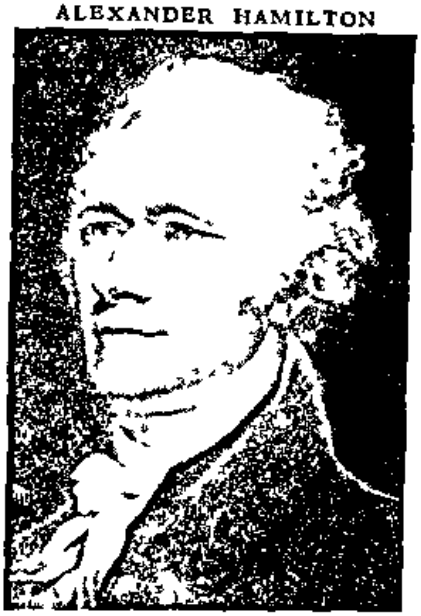
His Career in the Army

Hamilton's course at King's College (now Columbia University) in New York City was interrupted by the outbreak of the Revolutionary War. As early as 1774 he had begun to advocate the cause of the colonists, and when the conflict began he entered the army, and was soon made captain. Then for four years (1777–81) he was on Washington's staff with the rank of lieutenant colonel. He took a brilliant part in the field in the campaign which ended with Cornwallis' surrender. Washington felt for him the sincerest admiration and affection.

Even during the war Hamilton had seen the need for a strong central government; and during the critical period which followed, when the country was "floundering helplessly in a sea of unpaid debts and broken promises," he advocated the formation of a new constitution to take the place of the weak Articles of Confederation. He persuaded New York to send delegates to the Philadelphia Convention, and was himself chosen as one of the three to represent the state; but the other two were bitter Antifederalists and he was constantly outvoted until they withdrew from the convention. Then Hamilton signed the Constitution for New York. He believed that a limited monarchy like that of Great Britain was the best on earth, and failing that, he would have preferred a strong aristocratic republic, with the officers

chosen for life Nevertheless he exerted all his great powers in support of the Constitution that was formed The opposition in his own state under Gov George Clinton was very strong and without New York's ratification the Constitution could win no real success Hamilton, therefore, with the assistance of Madison and Jay, wrote a series of newspaper articles in its defense over the signature "The Federalist" Not only did these articles prove the decisive factor in securing New York s ratification, but they had a tremendous influence throughout the country Although written only to serve a particular purpose in his own day they have proved of great permanent value to students of law and political science and are regarded as a classic commentary on the Constitution

ALEXANDER HAMILTON



He was one of the greatest constructive statesmen in United States history

Washington appointed Hamilton as the first secretary of the treasury, and it was in this office that he left his strongest impress on the American government It was he who at the outset gave the government under the Constitution its leaning toward strength and national unity on which Chief Justice Marshall was later able so effectively to build

Hamilton's financial measures not merely assured the payment in full of the foreign and domestic debt of the United States but also included the taking over by the United States of the debts contracted by the states as a result of the Revolution This provision he carried through Congress only by a bargain which gave to the South the location of the federal capital on the Potomac But the effect of the measure was not merely to restore the credit of the country, but to bind to the Union every holder of state and national "script" or bonds Other important measures included the establishing of a national bank and the enacting of a tariff which should "protect infant industries" No American statesman ever had greater tasks to face than had Hamilton, and none was more successful in meeting them

In his efforts to strengthen the national government he was opposed by Jefferson, the secretary of state, who was a firm believer in states' rights In foreign affairs Hamilton favored England and Jefferson leaned toward Revolutionary France The two became the leaders of the first organized political parties of the United States—the Federalists and the Democratic Republicans (*see* Political Parties) Jefferson resigned from office at the close of 1793, and Hamilton a year later, but their party antagonism continued In the election of 1800 Jefferson's party swept the country, but owing to a tangle of the election laws Congress was called upon to decide whether Jefferson or Aaron Burr should be president Hamilton used his influence to defeat a plan of the less scrupulous Federalists to substitute the vice-presidential candidate for the presidential candidate of their opponents Hamilton knew that the voters meant Jefferson to be their chief executive, and besides he profoundly distrusted Burr

As a result of Hamilton's persistent opposition to him Burr finally challenged Hamilton to a duel According to the accepted code of honor in his day, Hamilton could not refuse the challenge On the morning of July 11, 1804, they met at Weehawken a noted dueling ground on the Jersey shore of the Hudson opposite New York City Hamilton did not intend to fire, but his opponent aimed with deadly precision Hamilton fell mortally wounded and died the next day He was generally mourned by his countrymen Even those who differed from him politically were compelled to respect his great abilities and patriotism, and his untimely death was looked upon as a great public calamity

HAMILTON, ONTARIO Its location on an excellent harbor at the western end of Lake Ontario, and the cheap electrical power obtained from Niagara Falls, have combined to make Hamilton one of the foremost manufacturing cities of Canada It is the center of the nation's steel industry and in addition produces textiles, farm machinery, electric wire and cables, aircraft automobiles and trucks tires, tin plate, and many other articles Nearly a hundred American firms have branches in Hamilton It is also the distributing center for the rich Ontario fruit district

The city lies at the foot of Mount Hamilton, a continuation of the ridge over which Niagara Falls plunges A park and monument mark the site of the battle of Stoney Creek, an engagement of the War of 1812 Hamilton was founded in 1778 by United Empire Loyalists, former citizens of the American Colonies who preferred to remain British after the Revolution It became a city in 1846 It is the seat of McMaster University Population (1951 census), 208,321

'HAMLET' By almost universal consent this is regarded as Shakespeare's greatest tragedy. The opening of the play reveals Hamlet, the young prince of Denmark, plunged in bitter grief by the sudden death of his royal father, who according to report had died of a serpent's sting The fact that the queen, his mother, has almost immediately married the dead king's ill-favored brother adds to the prince's sorrow To him appears from the tomb the dread spirit of his father, revealing that, "sleeping, by a brother's hand" he had been put to death, and calls

upon Hamlet to revenge this "foul and most unnatural murder." Hamlet's brilliant, sensitive mind is thrown into feverish activity by the horror of the deed. He pretends insanity, the better to watch the guilty pair. Distracted between his duty of revenge and his inability to form a plan, he contemplates his own suicide. "To be or not to be"—he muses bitterly, "that is the question." In a court play he has the actors insert a scene like that of his father's murder, then observes the king's reaction. The king's confusion confirms the ghost's revelation.

By mistake Hamlet kills Lord Polonius, father of Ophelia whom Hamlet loves. She goes insane and drowns herself. Polonius' son, Laertes, swears revenge. The king uses him to carry out his own plan to murder Hamlet. A dueling match is arranged with Hamlet. Laertes, by the king's advice, is to use an untipped foil, poisoned at the point, while the king will furnish a cup of poisoned drink to quench Hamlet's thirst. In this tragic duel, Hamlet is slain as planned, but Laertes himself is pierced with his own poisoned sword. The queen by mistake takes the fatal drink, and Hamlet in the moment of his death stabs the king.'

HAMPDEN, JOHN (1594–1643). "Patriot" Hampden was one of the Puritan statesmen who opposed the autocratic government of Charles I and brought on the English Civil War. He was a man of wealth and position, a cousin to Oliver Cromwell, and one of that leader's ablest advisers.

When Hampden refused to pay the illegal ship-money tax levied by Charles, he became a popular hero and a central figure in the Puritan Revolution. In the early days of the Long Parliament (1640–60), Hampden was right-hand man to the leader of the Puritan cause, John Pym. He also was one of five members whom King Charles attempted to seize on Jan. 4, 1642. This act led rapidly to war.

When hostilities began, Hampden joined the parliamentary army. He was mortally wounded at Chalgrove Field, June 18, 1643, and died June 24. His capacity as a statesman and as a soldier prompted the historian Macaulay to say that if Hampden had lived he would have been the Washington of England.

HAMSTER. The Syrian golden hamster is a small rodent, related to the rat and mouse. Since the first female and young were discovered in 1930, the hamster has become a popular pet, and it is replacing the guinea pig for experimental use in research.

The full-grown adult is only five or six inches long and weighs about a quarter of a pound. The dense, silky fur is a rich mahogany red on the back. The belly and legs are creamy white. The animal has large, alert ears and a tiny stump of a tail. It has large cheek pouches in which to store food until it can be hidden in its den.

THE SYRIAN GOLDEN HAMSTER



This little cousin of the rat and mouse stuffs food into its cheek pouches with handlike front paws.

The hamster is ideal for laboratory experimentation because it is more susceptible than the guinea pig to certain human diseases, and it breeds even more rapidly. The entire life cycle may be observed by students in a single school semester. The female begins to bear young at 59 days. The gestation period is 16 days. From 2 to 15 young are born every six weeks for a year. Then the animal ceases to reproduce The young are born naked and blind. The fur appears in two or three days; the eyes open in from 14 to 16 days. The animals stop feeding on the mother's milk at 22 days. The life span is from two to three years.

Hamsters make attractive pets, for they are clean, gentle, healthy, and free of parasites. They live best in a small pen, one to two feet square. The floor of the pen should be covered with any dry, soft, absorbent material, deep enough in one corner to provide a hiding place for food. In nature the animals are grain eaters, but they thrive on any vegetable scraps. They sleep during the day and eat at night. They should be kept in a warm room of about 70 degrees, for they become sluggish and go into hibernation at low temperatures.

Hamsters are native to Europe and western Asia. There are several species. Only the Syrian golden hamster (*Cricetus auratus*) makes a good pet and laboratory animal, for the others are vicious and bloodthirsty. It was first imported into the United States from Syria in 1938 for laboratory use by the Public Health Service.

HANCOCK, JOHN (1737–1793). The name of this Boston patriot heads the list of those who signed the Declaration of Independence. From this circumstance came the phrase "to give one's John Hancock," meaning to sign one's name.

When Hancock was a child, his father died, and he was adopted by his uncle, the richest merchant in Boston. He inherited the uncle's wealth when he was only 28 years old. In 1768 his sloop, the *Liberty*, was seized by British authorities for nonpayment of duty. Its cargo of wine had been smuggled ashore. The seizure precipitated a riot on shore. The ship was used by the British as a coast guard vessel until it was burned by a patriot mob at Newport, R. I.

The episode aroused violent popular feeling and was an important prelude to the revolution. Hancock's opposition to British rule was no doubt inspired by business interest, but whatever his motives, he was valuable to the cause. In 1770, after the Boston Massacre, he was one of the committee that went to the governor to demand the removal of British troops from the city. At the funeral of the victims he delivered an address which led to an order for his arrest. He was president of the revolutionary Provincial Congress which met at Concord and later at Cambridge, and his arrest was one of the

objects of the British expedition to Concord which *precipitated the battle of Lexington* and Concord and began the Revolutionary War

Hancock was elected president of the Second Continental Congress in 1775 and held that office two years In 1780 he became the first elected governor of Massachusetts, and was annually re-elected with an interval of two years (1785-1787) until his death The support which he was finally induced to give to the Federal Constitution in 1788 was the decisive factor in the struggle for ratification in Massachusetts and in setting the new plan in operation

Despite the jealousy and vanity which limited his work Hancock was a man of strong common sense and sound patriotism and it meant much to the cause of the colonies to have the support of his wealth social position and education when many of the upper class were Loyalists or Tories as their enemies called them

HANCOCK WINFIELD SCOTT (1824–1886) One of the best all round soldiers among the Union officers of the Civil War was Winfield Scott Hancock He received his military training at West Point graduating in 1844 and gained experience in the War with Mexico He was a captain when the Civil War broke out and was soon commissioned brigadier general and helped to organize the Army of the Potomac He did gallant service in the battles of South Mountain and Antietam (1862) At Fredericksburg (December 1862) he led his corps in a desperate attack on Maryes Height through a deadly fire from which less than 3 000 of the original 5 000 came back At Gettysburg (1863) it was said that his appearance on Cemetery Ridge on the first day of the battle was equal to reinforcement by an army corps Men who were fleeing stopped and the troops were restored to order

General Hancock was in command of the Second Corps and it was his forces which on the last day of the battle stopped the terrible charge of Pickett's men and deprived the South of all hope of victory During this attack Hancock was seriously wounded but he stayed on the field until the victory was won After he recovered from his wounds he bore an important part in the hard fought battles of the Wilderness Spottsylvania and Cold Harbor in 1864 At Spottsylvania he carried the Confederate works known as the bloody angle capturing 3 000 prisoners For his notable services Hancock was promoted to the rank of major general in 1866

In 1880 the Democratic party made him their candidate for the presidency but in the election he was defeated by James A Garfield who in addition to an honorable *military career* had long been a leader in Congress Hancock remained in the army until his death serving his country for over 40 years He was a brave fearless leader and an able commander McClellan called him superb and Grant wrote Hancock *stands the most conspicuous* figure of all who did not exercise a separate command

HAND Whatever men have done that distinguishes *them from the brutes* has been done by their brains But the hand has been the instrument of the brain in bringing about almost all of *these successes* The cultivation of the soil mining building *manufacturing—sculpture* painting literature—*what could man* have done without his hands? Can you imagine this book to be written printed bound and distributed without hands? *Apart from the hand speech is the* only important instrument of the brain that distinguishes man from the lower animals

The human hand is indeed a wonderful piece of mechanism Placed at the end of the arm with the ball and socket joint at the shoulder the hinge joint at the elbow and a peculiar *joint at the wrist the* movements of the hand are indeed marvelous

The eight bones of the wrist are called carpal bones the five of the palm are the metacarpals and the 14 in the fingers are the phalanges These phalanges are so called because they are arranged in ranks as were the Greek soldiers in the military formation known as the phalanx All these bones are bound together by tough flexible ligaments.

The muscles that move the hand are mostly upon the forearm and have long tendons by which the pull of the muscles is communicated to the different joints You can feel and see some of these tendons in your wrist when you bend your fingers There are more than 30 pairs of muscles producing hand motions

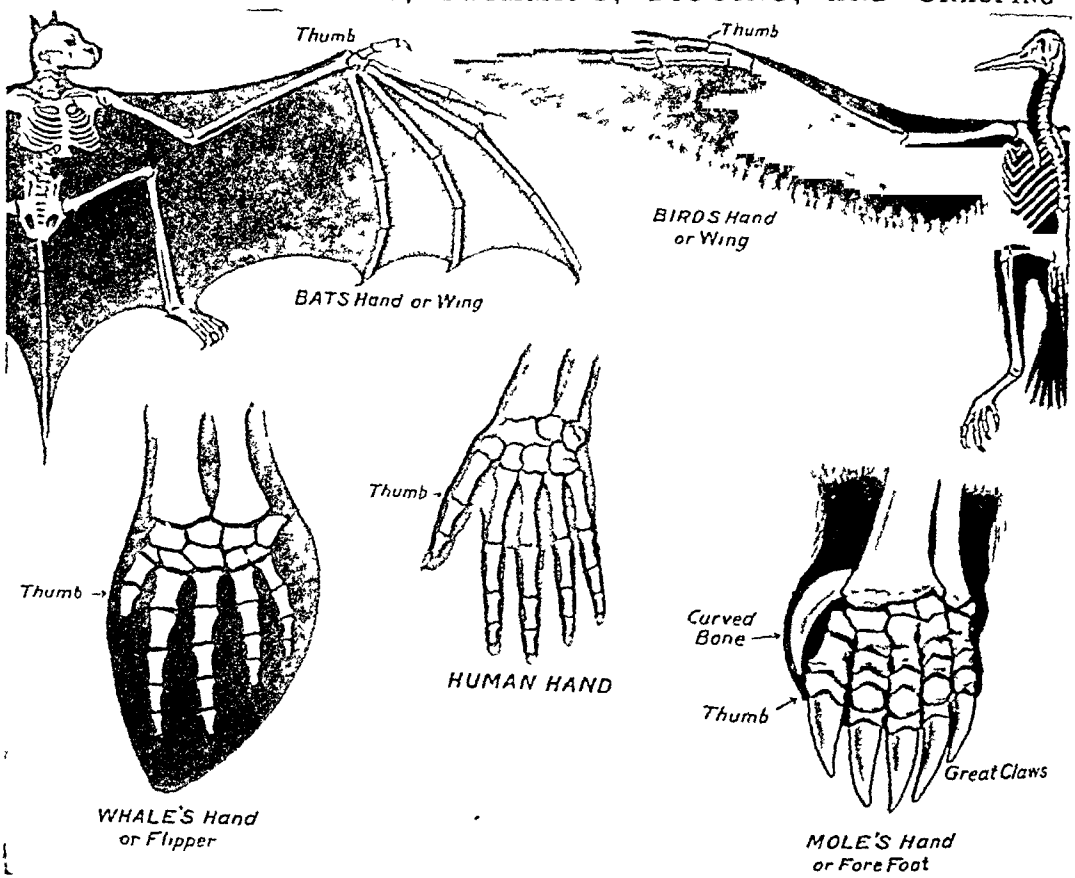
The thumb is arranged so as to work against the fingers in very useful grasping movements Just make believe that you have no thumb *and try to* pick up something or to write or to use a fork!

The sensibility of the hand is more highly developed than in most other parts of the body There are many little elevations or *papillae* on the skin of the palm and fine nerve fibers extend from these to the brain Thus the skin is made very sensitive to touch heat and cold

Because it possesses both strength and lightness of touch the hand is wonderfully adaptable to all sorts of uses The flexible fingers can grasp large objects firmly and manipulate delicate machinery while the nails on the tips make it possible to pick up very small things The same hand that wields the hammer may adjust the minute parts of a watch The lightning *like rapidity with which trained finger muscles* can perform tremendously complicated tasks such as the fingering of violin strings by a Kreisler or the rippling of piano keys by a Paderewski must always seem a miracle to the ordinary man

While the human hand is the most completely developed in the animal kingdom for all round purposes of protection strength blows grasping delicate movements and sensitiveness it is interesting to note that the fore limb of all mammals is formed on the same general plan The horse's front hoof is just a modified finger nail all the fingers but one have disappeared or are represented only by the remnants called 'splints In these animals the modifications

"HANDS" FOR FLYING, SWIMMING, DIGGING, AND GRASPING



While the human hand is the most perfect instrument of all, other creatures also have "hands" adapted to various purposes. The fingers of the bat, as you can see, have grown very long to support his wings, the "thumb" remaining free to be used as a clinging hook. The bird's "hand" has lost almost all its fingers, stiff feathers taking their place. The whale's hand is broad and short, but all the fingers are plainly represented. The mole not only has the usual five digits, but also an extra bone to make his digging palm even broader, and his "fingernails" have developed into huge claws.

are for purposes of speed in running. In the bat, very long fingers are developed to support the web which, instead of feathers, constitutes the "wing" in those flying mammals. The beaver's hand has a still different form, adapted to its mode of life. The mole has a broad shovel-shaped hand. Even the whale has a fore limb which has the modified structure of a hand.

HANDBALL. A game in which a ball is hit with the hand against the walls of a court began in Ireland about a thousand years ago. For hundreds of years, this game called handball was little played except in Ireland. Then, in the 1880's, the Irish brought it to the United States. On the first handball courts built in Brooklyn, N. Y., the game was shown to be so fast and lively that athletes the nation over wanted to try it. Today most of the large gymnasiums have handball courts, where men regularly test their skill, speed, and endurance.

Handball is played either on a four-wall court or a one-wall court. *Four-wall handball* is the game which originated in Ireland. *One-wall handball*, to be described later in this article, was developed in New York City about 1900 from the four-wall game.

Four-Wall Handball

The diagram on the next page shows the arrangement of a standard four-wall court. The back wall is lower than the other walls, and above it is a gallery where the referee and the scorer are stationed and from which spectators may watch the game.

A black rubber ball is used, 1⅞ inches in diameter and 2⅛ ounces in weight. Though soft, it can sting the bare hands on its lively rebound from the walls. Hence many players wear special gloves in addition to the usual track suit, wool socks, and heavy-soled tennis shoes.

Two, three, or four persons may play. When two play, one is the *server;* the other, the *receiver.* When three play, the server is opposed by two receivers. When four play (doubles), the server and his partner form the *serving side;* their opponents, the *receiving*

side The ball may be struck with either hand *but not kicked*

In serving the server must stand in the *service zone* between the *short line* and the *service line* He must drop the ball to the floor within the service zone and then strike the ball on the bounce so that it hits the front wall first and on the rebound lands on the floor *behind* the short line A served ball landing in front of this line is a *short* Two shorts in a row score an *out* against the server He then becomes the receiver and his opponent becomes the server In doubles the server's partner must stand in the *service box* with his back to the wall until the ball passes the service line

The receiver must stand *behind* the short line while the ball is being served He must play the serve either on the fly or the first bounce so that the ball returns to the front wall without hitting the floor Then the server hits the ball on its rebound from the wall and play continues with the opponents alternately hitting the ball until one of them fails to return it legally to the front wall

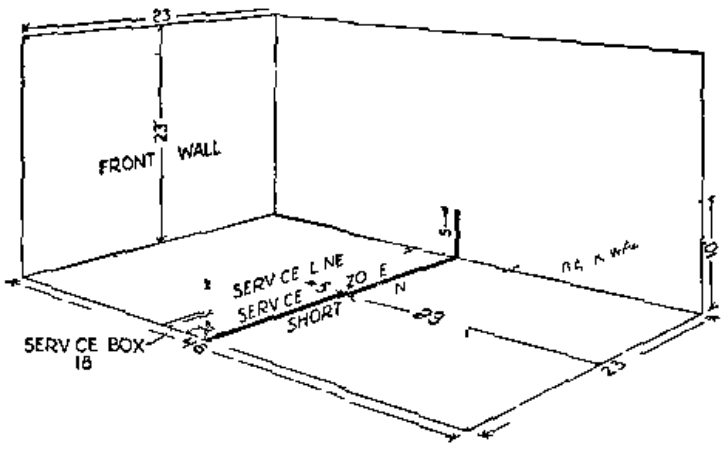
If the server fails to make the return an *out* is scored against him and he then becomes the receiver If the receiver fails to make the return a *point* is awarded the server who continues to serve until he is out Thus only the server or the serving side scores points A game is 21 points a match the best two out of three games

The rules permit a served ball after hitting the front wall to strike one side wall before landing behind the short line A returned ball is permitted to strike the side walls and ceiling before hitting the front wall From there the ball may bound clear to the back of the court and may be played from the back wall The lightning speed with which the ball bounces about the court makes the game very interesting to watch

One Wall Handball

One-wall handball is played on a court having a wall 20 feet wide and 16 feet high The court is 20 feet wide and 34 feet long The same ball and the same system of scoring are used as for four wall handball Two or four persons may play In a fast game considerable skill is required to keep the ball within bounds since the court is open on three sides The one-wall court permits the game to be watched by more spectators than the four wall court and it costs less to build The wall is often built long enough so that several courts can be laid out on both sides of it This makes the one-wall game popular at playgrounds as well as in gymnasiums

STANDARD FOUR WALL HANDBALL COURT



This diagram gives the measurements of a handball court and for clarity labels the walls and floor The ceiling is not shown The lines on the side walls at the short line are designed to help the referee call serves

HAN'DEL, GEORGE FREDERICK (1685–1759) The name Handel suggests Christmas and the Messiah', with its glorious Hallelujah Chorus This oratorio of his has for so many years been given in connection with the holiday festivities that it has come to be a tradition of the season

Although Handel was born a German he won his first great fame in Italy with his Italian operas He later became an English citizen and is today chiefly remembered for his English oratorios

The father of Handel a German doctor of Halle was much opposed to his son's musical ambitions But the boy was obsessed with a desire to learn to play the clavichord (an ancestor of the piano) and at the age of eight years had taught himself When an opportunity was presented for him to play the organ in the castle of a neighboring duke he did it so skillfully that the duke persuaded the lad's father to give *his son a musical education* The boy at once became a pupil of the organist of the Halle cathedral



GEORGE FREDERICK HANDEL
Master of the Oratorio

At the age of 11 he was master of the organ harpsichord violin and other instruments and was proficient in musical composition When 20 years of age he produced his first opera which was favorably received He went to Italy to study the Italian style of opera and there his brilliant performances on the harpsichord surprised audiences by their rare beauty

Handel next went to London where his triumph was repeated England offered so much in the way of opportunity and appreciation *that when 41 years of age Handel* became a naturalized Englishman Seven years later he began his career as an English composer using from that time only English texts for his oratorios It is to these that his greatest fame is due

Other musicians were composing operas, but English oratorio, as composed by Handel, was an innovation. The English people loved his music, and the royal family were always his stanch supporters. Handel grew old, blessed by the comfort of his music and many friends. The bitterest trial of his life came in his later years, when he became totally blind. Yet he still played and conducted his oratorios.

Handel will never cease to be revered as one of the greatest of composers. Besides his 18 English oratorios, his works include 41 Italian operas, 2 Italian oratorios, 4 English secular oratorios, 3 volumes of English anthems, 1 volume of Latin church music, 3 volumes of Italian vocal chamber music, 37 instrumental duets and trios, and 4 volumes of orchestral music and organ concertos.

HANDWRITING. Sloppy, careless handwriting suggests a sloppy, careless person. The ability to write neatly and clearly should therefore be cultivated as carefully as good table manners. Good writing is important in social life, for invitations and most personal letters are properly handwritten. It is important also in business, for even though business letters are typewritten today, short notes and memorandums are usually written by hand.

In the United States two systems of handwriting are in general use. *Manuscript* writing looks very much like typing or printing and in fact is often called "printing." Both capital letters and small letters are formed individually and are not run together. The characters are written vertically rather than slantwise, and many of the letters are made up of several individual strokes of the pen. Manuscript is actually the older form of handwriting, but it was not taught in the schools of the United States until after the first World War.

Cursive writing is what many people mean when they use the term "handwriting" or "script." In cursive, the small letters and many capitals are run together within a word. Such writing ordinarily slants to the right, and several of the letters, such as *f* and *s*, look very little like the printed or manuscript forms. Generally speaking, manuscript writing is easier to learn and to read, while cursive has the advantage of greater speed.

In schools now, children are usually taught manuscript writing first, beginning in the first grade. They practice writing at the blackboard, for the large movements of the arm are easier to control than the small ones of the hand and fingers. When writing on paper is begun, it is done with a soft pencil on large sheets of fairly rough paper. Later, often in the third grade, children are taught to use the pen. After mastering the steel pen, children are allowed to use fountain pens in many schools.

An increasing number of schools teach manuscript writing throughout the grades. Where cursive is taught, it is often introduced in the intermediate grades. Children are usually encouraged to keep up their skill in manuscript, however, because of its usefulness in drawing, science, and other subjects. From the beginning, left-handed children should be allowed to write with the left hand and should be taught how to place the paper for greatest ease in writing.

A compromise between manuscript and cursive called *joined manuscript* is sometimes taught. The letter forms are those of ordinary unjoined manuscript, but many of them (such as *m* and *t*) are given "tails" that connect them with the following letter. Joined cursive may be used to make the transition between manuscript and cursive or it may be taught as a regular form of handwriting.

Although the subject has nothing to do with the teaching of penmanship, teachers are sometimes asked about the validity of graphology. According to the lore of this so-called science, a person's character can be deduced from his writing. Some general traits of personality may be expressed in an individual's writing, but psychologists deny that handwriting is a detailed expression of personality. The claims of graphologists are therefore largely false.

HANG'CHOW, CHINA. When Marco Polo, the greatest of medieval travelers, visited Hangchow near the end of the 13th century, he was delighted with the number and splendor of its mansions and the wealth and luxury of its people. Later he declared it to be the finest and noblest city in the world (*see* Polo, Marco). It still ranks as one of the richest cities of China, though it lost much of its ancient magnificence when it was laid in ruins by the Taiping rebels in 1861. Its shops are noted for their size and the excellence of their stock, and its manufactures of silk, paper fans, tapestries, ivory carvings, and lacquered ware are world famous.

Hangchow, which is about 100 miles southwest of Shanghai, lies near the head of the estuary of the Tsien-tang River, 50 miles from the ocean. Although the river is visited at certain seasons by destructive "bores"—great tidal waves 15 feet high which rush upstream at the rate of 15 miles an hour—it is constantly crowded with small craft which transport vast quantities of merchandise to and from the southern provinces. An immense amount of traffic is also carried by the Grand Canal, which ends here.

Above all it is a city distinguished for its heritage of culture and for its beauty. The Chinese say, "Heaven above, Soochow and Hangchow below." The old city, now partly modernized, lies on the shore of Si-hu, or West Lake, at the foot of the Eye of Heaven Mountains. Its monasteries and splendid Buddhist temples attract thousands of pilgrims and visitors. From the 10th to the 13th centuries it was the capital of southern China. In 1896 it was opened to foreigners. Japan held the city from 1937 to 1945. Population (1947 estimate), 437,522.

HANKOW', CHINA. Though Hankow is 600 miles from the sea, it is one of the world's great ports. Ships of all nations steam up the Yangtze River from Shanghai to this noisy, crowded city far inland in Hupeh province. It stands at the junction of the Yangtze

and the Han Across the Han is the city of Hanyang, and on the south bank of the Yangtze is Wuchang, capital of the province This 'Triple City" of Hankow, Hanyang, and Wuchang is called Wu-Han and is the industrial and commercial heart of central China

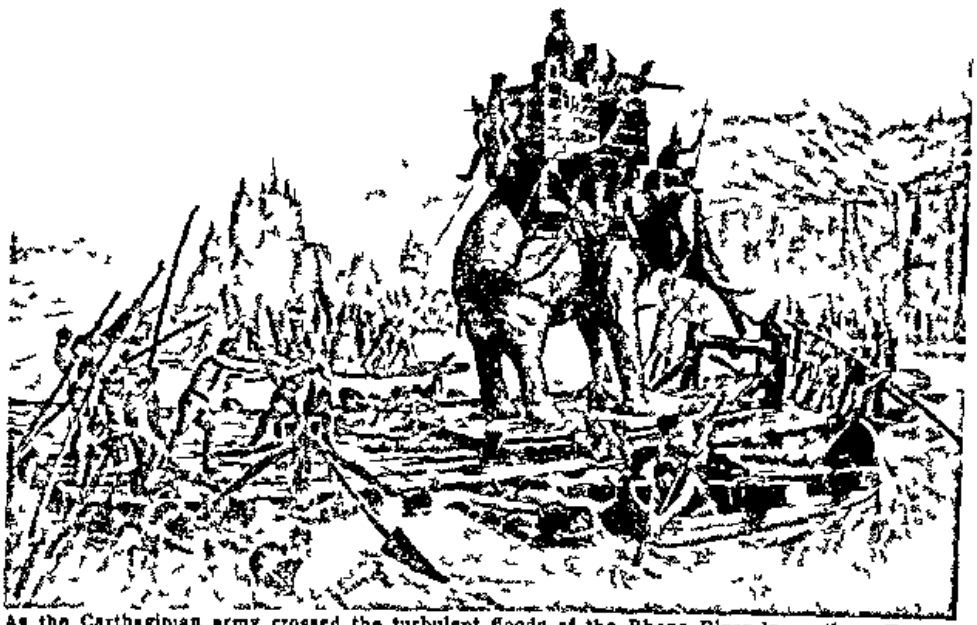
The Triple City is so centrally located that the Chinese call it ' The Collecting Place for Nine Provinces " Ships drawing 30 feet can reach it from Shanghai It is about midway on the Canton Peiping (Peking) railway, and roads and waterways fan out from it to all parts of the vast Yangtze plain To its mills and factories and docks come hides and skins, wheat, tobacco, cotton silk, rice beans, tung nuts, tea, sesame seed iron coal and antimony

Of the three cities, Hankow is the most important Opened to foreign trade in 1858, its chief business is exporting Junks, steamers and lighters usually crowd the yellow surging river In the native quarter, wheelbarrows and shouting groups of bargaining shopkeepers and customers clog the narrow streets But the foreign concessions and business sections are imposing and efficient

Ancient Wuchang is chiefly a receiving center for inland trade Hanyang is industrial, and China s first modern iron smelter was built here in 1890 followed by a steel mill Hanyang once promised to become a big iron and steel center but financial troubles halted production When Japan attacked the Triple City in 1938 many of its 1 500 000 people fled and the retreating Chinese army destroyed scores of factories The Japanese held the city until 1945 Population of Hankow (1947 est) 749 952

HANNIBAL (about 247–183 B C) 'I swear that so soon as age will permit, I will follow the Romans both at sea and on land I will use fire and steel to arrest the destiny of Rome " The boy Hannibal stood at the altar beside his father, the great Carthaginian general Hamilcar Barca, and repeated this solemn oath of enmity against his country s powerful rival The warrior and his young son were setting out together for Spain, where Hamilcar hoped to gain conquests that would compensate Carthage for the possessions that Rome had wrested from it in the disastrous First Punic War He was taking Hannibal with him that he might learn the ways of war and prepare to renew the death struggle with Rome

HANNIBAL'S ELEPHANTS MOVE TOWARD ITALY



As the Carthaginian army crossed the turbulent floods of the Rhone River in *southern France*, special rafts had to be built for the giant beasts of war In battle, the elephants were armored and were used in much the same way as tanks are used today

So well did Hannibal learn his lesson that after his father s death he succeeded to the *command of the* army in Spain, and three years later (218 B C) was prepared to renew the contest to which he had been dedicated While the Roman senate was planning to invade the Carthaginian domains Hannibal was already starting on the most daring march known to the ancient world

Along the eastern coast of Spain, over the Pyrenees Mountains and across the swift waters of the Rhone, he led his forces of 50 000 foot soldiers, 9,000 horsemen and scores of elephants It was already autumn and the cold was intense when this band, accustomed to the sunny lands of Africa and Spain, began to cross the perilous Alps Blinded and almost overwhelmed by snowstorms, over steep and narrow paths they struggled, cheered and encouraged by their dauntless leader In places the natives rolled heavy stones down the mountain sides upon them, many men slipped down the icy precipices and were killed, others perished of cold, hunger, and exhaustion, so that the army was reduced to less than half its original number when it descended upon the plains of northern Italy

By the skillful use of cavalry tactics, in which the Romans were weak, Hannibal won two great victories, at the Trebia River and at Lake Trasimene Alarmed at these disasters, which had shattered one army and nearly destroyed another, the Romans appointed a dictator—an official invested with extraordinary power Their choice fell upon a wise statesman named Quintus Fabius Maximus Instead of risking an engagement at once, Fabius adopted a policy of following the Carthaginian army, delaying it and harassing it in every possible way. Because of

his cautious tactics he was nicknamed *Cunctator*, or "delayer," and even to this day cautious generals who practise similar tactics are said to pursue a "Fabian" policy.

At last, in the summer of 216 B.C., a Roman army of between 70,000 and 100,000 met Hannibal's band at Cannae, near the southeastern coast of Italy. Though far outnumbered, Hannibal managed by clever strategy to surround the forces of his enemy and annihilate them. Ex-consuls, senators, nobles, thousands of the best citizens were among the 60,000 slain. Of the gold rings which they wore as an indication of their rank, Hannibal is reported to have sent a bushel to Carthage.

Won a Great Battle but Lost the War

But the victory bore little fruit, for Hannibal was one man fighting against a nation. He failed to receive support either from his own countrymen or from the Italians that he subdued during the 15 years that he remained in Italy. His brother Hasdrubal, coming to his aid with reinforcements from Spain, was met by a Roman force, completely defeated, and slain. His severed head was hurled into the camp of Hannibal, who anxiously awaited him. Still Hannibal struggled on, until a Roman army under Scipio Africanus invaded Carthage and he was forced to return home. At Zama in his own country, the lion-hearted commander who for 15 years had ravaged Italy suffered a crushing and final defeat. The long battle for supremacy was ended and Rome was mistress of the Mediterranean.

Hannibal now showed that he could be a statesman as well as a soldier. Elected chief magistrate, he reformed and strengthened the government of Carthage and contrived to pay, without hardship to the people, the heavy tribute exacted by Rome. The Romans, alarmed by this prosperity and by the charges of his enemies that he was plotting to renew the war against Rome, demanded Hannibal's surrender. To avoid falling into their hands, he fled to Asia, and when several years later the Romans hunted him out, he took poison, which, we are told, he always carried with him in a ring.

So died one of the greatest and most gifted military leaders of ancient times—an ardent patriot, a crafty strategist, and the most formidable foe that ever threatened the Roman Republic at the height of its powers. (*See* Carthage.)

HANOVER, GERMANY. For more than 120 years the kings of Great Britain were also German princes, ruling the kingdom (formerly electorate) of Hanover in northwestern Germany. This came about when George I, founder of the Hanoverian (or Brunswick) line, ascended the English throne in 1714. It ended in 1837 when the death of William IV, great-great-grandson of George I, left the Hanoverian line without a male successor. In England, Victoria ascended the throne. But Hanover's Salic law, forbidding female succession, denied her the Hanoverian crown. In the war between Prussia and Austria, in 1866, Hanover was allied with Austria, and victorious Bismarck then annexed it to Prussia. It became a Prussian province, with an area of 14,897 square miles, and a population of about 3,540,000.

The city of Hanover, capital of Lower Saxony, which includes the old province, contained an irregularly built "old town," with many quaint stucco-front houses, and handsome new quarters to the north and east. Hanoverians built many beautiful parks museums, and picture galleries to house a rich collection of art. For years the city attracted foreign students, especially English, eager to study Hanover's reputedly pure form of the German language. A wide variety of manufactures—including hardware, chemicals, machinery, and textiles—grew up in the historic city. As a center of industry and transportation, it was heavily bombed during World War II Population (1950 census), 444,296.

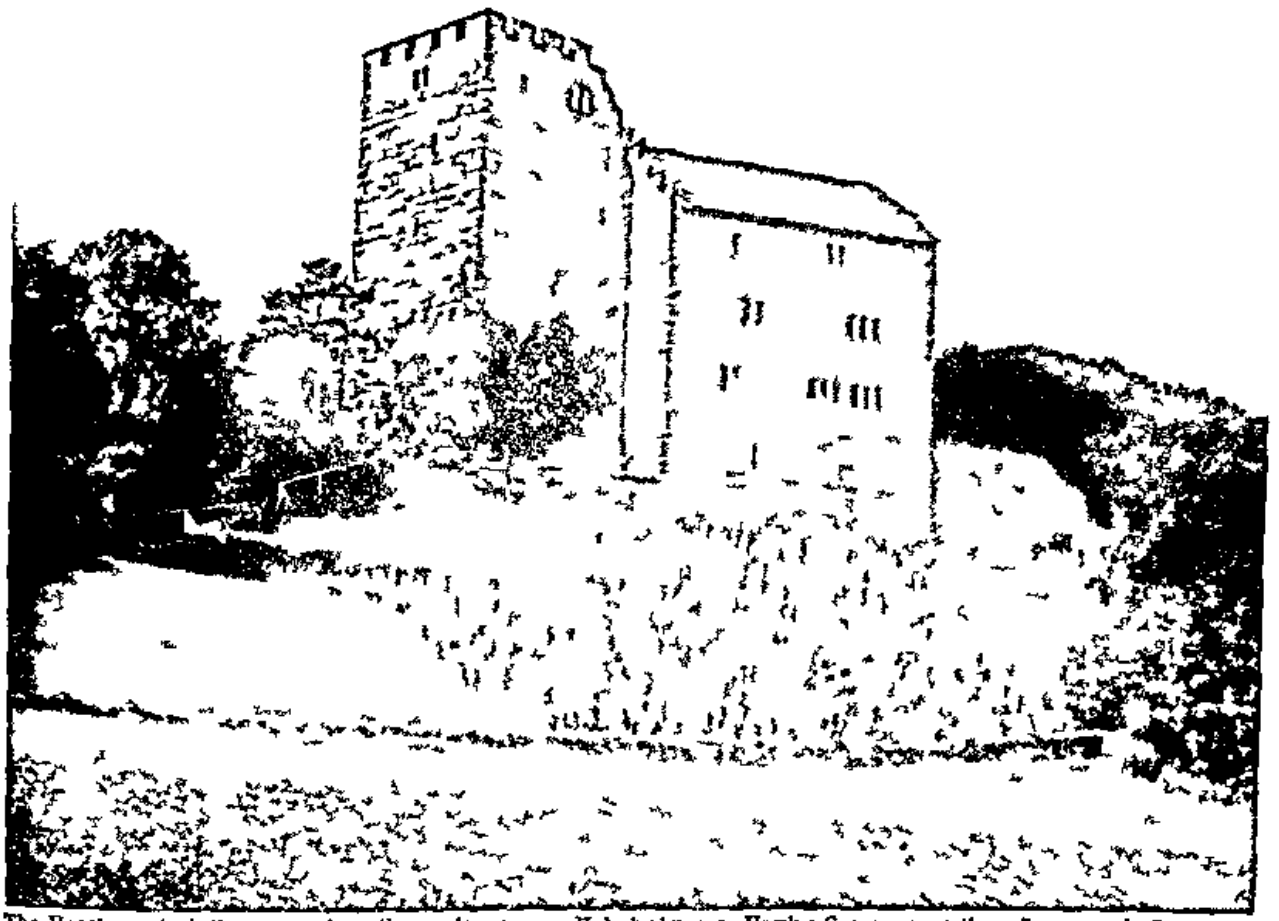
HANSEATIC LEAGUE. A fleet of tall-masted ships met in the sound off the coast of Denmark in the spring of 1368. They came from the cities of northern Germany belonging to the Hanseatic League, which was at war with the king of Denmark. For two years they harassed the Danish coasts and waters, sacked Danish cities, and plundered their treasures. At the end of that time the king of Denmark was glad to make peace, although the terms exacted were most humiliating. The cities of the League demanded a share in the Danish revenues for 15 years, the possession of Danish strongholds, and the final voice in the selection of the Danish kings.

This episode in the history of the loose confederation of North German cities known as the Hanseatic League gives an idea of the power it then possessed. It had been growing up gradually. No one knows just when it began. More than a hundred years earlier cities had formed alliances or "hansas" to protect their traders from the plundering barons along the highways and the pirates upon the seas. These alliances proved so useful that gradually more towns joined the strongest league, of which Lübeck was the center, and this union became known as the Hanseatic League.

Just how many towns were in the league no one knows. Even its ambassadors in London, when asked for the number of towns, scornfully replied that they could not be expected to know all the places, large and small, in whose name they spoke. At the height of its power in the 14th century it probably contained nearly 100 cities, extending from Dinant in Belgium to Cracow in Poland, and its "factories" or trading posts stretched from the "Steelyard" in London to the "Court of St. Peter's" in the faraway city of Novgorod, Russia.

In these foreign factories the representatives of the league lived almost like monks. They were forbidden to marry as long as they remained abroad. They could not leave the factory at night. Iron doors, savage dogs, and watchful guards were provided to enforce this rule. They could not associate with the people of the country except for business purposes, and they were required to be rigidly honest in their

EARLY HOME OF THE PROUD HAPSBURG DYNASTY



The Hapsburgs took their name from this modest castle—Habichtsburg or Hawk's Castle—in northern Switzerland. Later they lost their Swiss possessions but by that time they were ruling a vast empire from the brilliant capital at Vienna

dealings for the dishonesty of one would bring the wrath of the townsmen upon all.

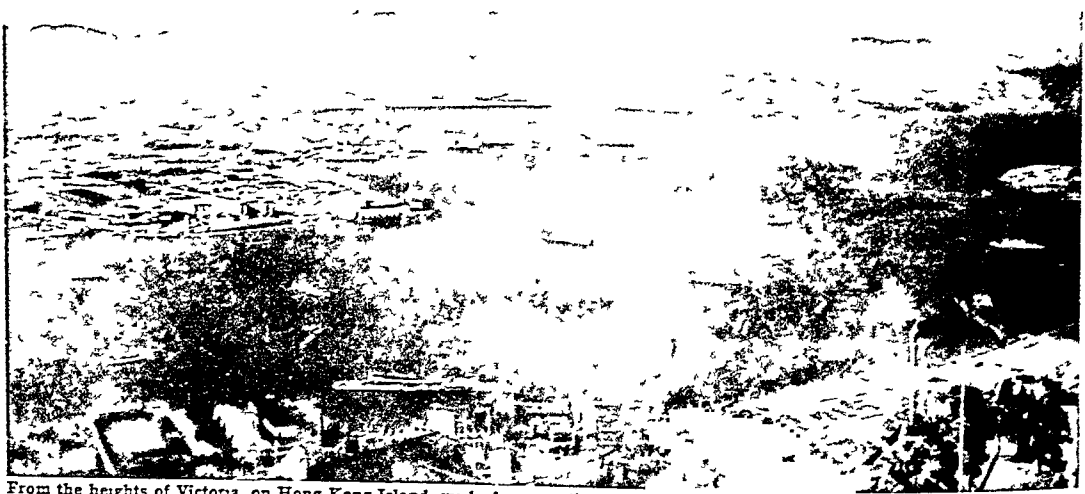
But the advantages more than balanced these restrictions. Merchants of the league were exempt from the taxes and tolls levied upon others. And in some places they had a monopoly of a certain trade as of the herring fisheries off the coast of Sweden. At the height of its power the league not only protected its merchants but also maintained its fleet and even engaged in war to safeguard its interests. It played an important part in suppressing lawlessness in carrying comforts and conveniences into half barbarous lands and in promoting enlightenment and civilization throughout northern Europe.

But quarrels between the towns gradually weakened the influence of the league for it was only a loose union whose assembly met every year or two but had no authority to enforce its decisions. The rise of strong political states such as Denmark created rivals and enemies for the Hansa. The discovery of America and of the route around Africa lessened the commercial importance of most of the North German cities. But the deathblow to the league came when the herring suddenly deserted their haunts off the shores of Sweden for the coast of Holland. The exclusive control of the herring fisheries had been the most highly prized privilege of the league and with that gone the members lost interest. By 1630 most of the towns had deserted the alliance but the free cities of Hamburg, Lübeck and Bremen continued to be known as Hansa towns until the latter part of the 19th century (*see* Bremen; Hamburg).

HAPSBURG. On the top of the Wülpelsberg (1,687 feet high) in northern Switzerland near the junction of the little river Reuss with the Aar stands the ruined Hawks Castle (*Habichtsburg*) which

was the original seat of the famous Hapsburg (or Habsburg) family. The castle was erected in 1020, and its owners ruled Austria from 1278 to the end of the first World War. With only one exception (Charles VII, 1742–1745), all the rulers of the Holy Roman Empire from 1438 until the abolition of the empire in 1806 were members of the Hapsburg house. The Emperor Charles V (1519–1556) was by descent on his father's side a Hapsburg (*see* Charles V, Holy Roman Emperor). After the division of his dominions there were two Hapsburg houses, one ruling Spain until the extinction of the line in 1700, and the other Austria. A full lower lip and a long pointed chin—the famous "Hapsburg chin"—became family features after a marriage with a Bohemian princess in the 15th century. (*See* Austria-Hungary.)

SHELTERED HAVENS *for the* WORLD'S SHIPS



From the heights of Victoria, on Hong Kong Island, we look across the ten square miles of its land-locked harbor toward Kowloon Peninsula and the Chinese mainland. Hong Kong is the chief port of southern China, rivaling Shanghai in the tonnage it handles. From ocean vessels cargoes are transferred to river craft or railroad cars for shipment to Canton.

HARBORS AND PORTS. The destiny of nations is to a great extent influenced by their coast lines. Commerce, with the progress in civilization which follows on its heels, most readily springs up where there are well-sheltered harbors in which ships may safely load and unload their cargoes. Despite its vast potential wealth, Africa, with the exception of the narrow strip along the Mediterranean, remained undeveloped until the 19th century largely because it has so few natural harbors. On the other hand, the civilization we enjoy today was born in the Mediterranean lands, where many safe harbors tempted men to traverse the sea and interchange products and ideas. One of the controlling factors in bringing about the differences between the "unchanging East" and the changeful West has been the abundance of harbors in Europe and their comparative scarcity in Asia.

The discovery of America turned the face of Europe westward, and the excellent harbors on Europe's west coast brought wealth and power to the countries owning them. Nearly all the early centers of settlement in North and South America were at some bay or river mouth which afforded shelter to the vessels of the first arrivals. The rapid growth of the United States and its commercial and industrial importance are due in part to its long strip of coast on the two great oceans, dotted with fine harbors. In South America, Bolivia and Paraguay are hampered by the lack of seacoast. Bolivia once owned the harbor of Antofagasta, but lost it to Chile in 1883.

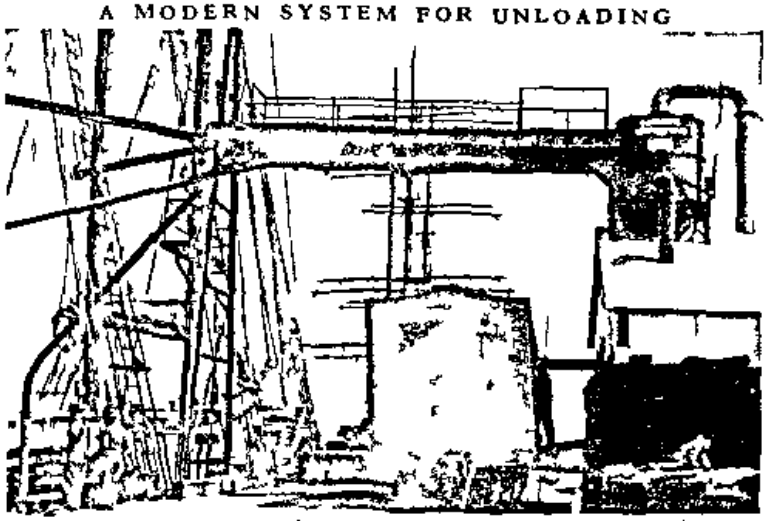
Rivalry between nations for harbors has brought many bloody wars, for the state without a coast line is at the mercy of any state whose territory it must cross to reach the ocean. The inland country battles for a strip of land along the sea, a single port, or even the establishment of a "free port" where its goods may be shipped without customs duties. At the end of the first World War the victorious Allies punished Austria by stripping it of its seacoast on the Adriatic and thus strangling its trade. And they rewarded the Poles by giving their restored country a corridor to the sea with unrestricted use of the German port of Danzig.

How Harbors Are Classified

Natural harbors are classed, according to their origin, as drowned valleys, deltas or river-mouth harbors, fiords, and lagoons. A good harbor must afford safe anchorage for vessels, protected from

storms deep enough for the largest ships to come close to shore and broad enough for many vessels and must have a direct channel to the open water In order that a good harbor may develop into an important port there must be the further advantages of freedom from ice and abundant room for docks piers wharves loading and unloading facilities and warehouses There must also be a broad area for the growth of a city and easy direct access to a productive interior The interior should furnish products for shipment and use raw materials brought in through the port for manufacture

A MODERN SYSTEM FOR UNLOADING



The machinery on the wharf is transferring copra (dried coconut kernels) directly from the hold of the schooner to the freight car on the track The pneumatic tubes on the left draw up the copra carry it over the bridge and deliver it into the car from the right The building contains the pumps which provide the suction

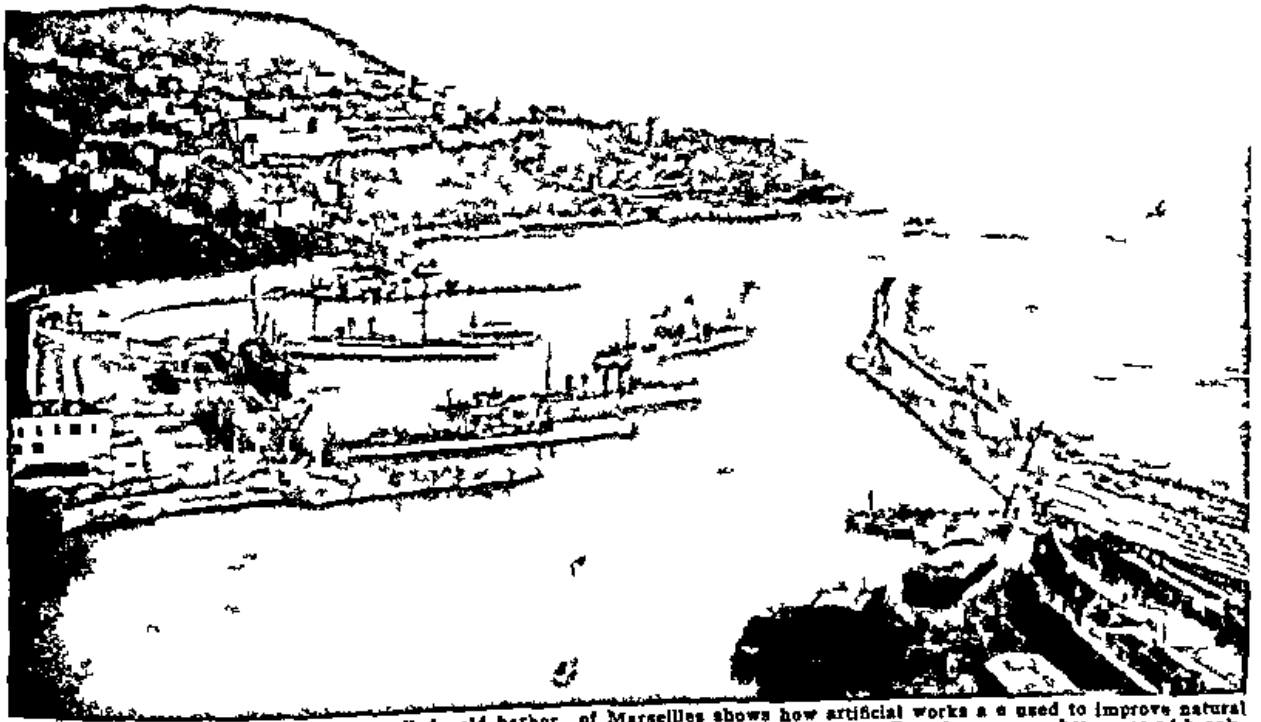
The world ports such as New York Baltimore Philadelphia San Francisco Seattle London Liverpool Hamburg and Shanghai owe their growth to the possession of all these advantages These harbors are drowned valleys formed by the sinking of the coast line which let in the sea to deepen the mouth of the river for a considerable distance

Rivers Cut Through Deltas to Seas

Great rivers such as the Mississippi the Amazon the Nile, and the Ganges are ever thrusting forward into the sea deltas formed from the vast quantities of silt brought down by the current from distant highlands These rivers have cut several channels through the deltas to reach the sea The advantage of a long river route back into the continent is why such a city as New Orleans is located near the head of a delta But great sums must be spent to dredge out the silt and to build *jetties to force the* current to scour out its own bed to deep water

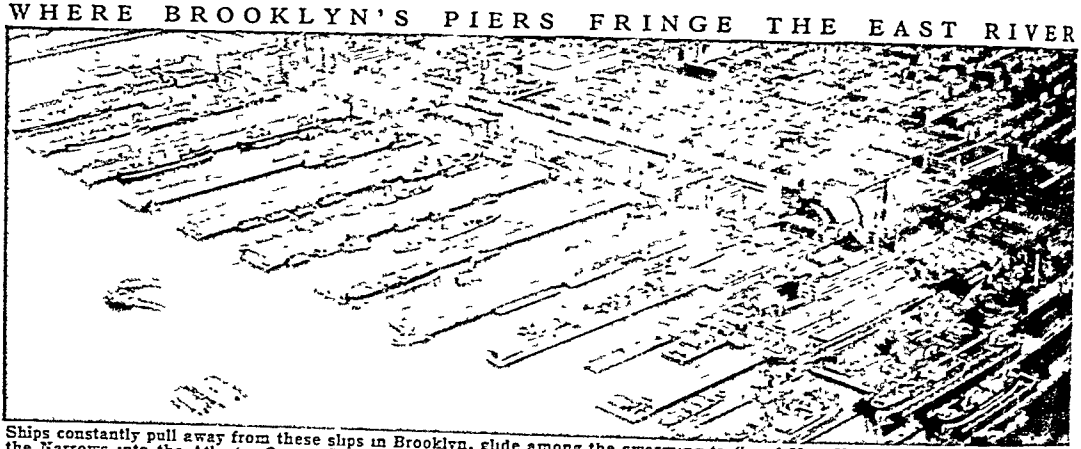
Fiords like most of those whose entrancing beauty lures thousands of tourists every summer to Norway's western coast can never become ports because the

HELPING NATURE PROVIDE A HARBOR FOR MARSEILLES



This picture of the entrance to the so called old harbor of Marseilles shows how artificial works are used to improve natural harbors *Although the land*-locked bay provides good shelter for vessels riding at anchor the French engineers have erected breakwaters to break the force of the waves across the harbor's *mouth and* dredged basins in order to let big ships come alongside the docks The ships we see here are mostly French naval vessels.

WHERE BROOKLYN'S PIERS FRINGE THE EAST RIVER



Ships constantly pull away from these slips in Brooklyn, glide among the swarming traffic of New York harbor, and plow through the Narrows into the Atlantic Ocean. Piers and wharves stretch for 755 miles along the waterfront of the Port of New York; of this total, 460 miles are in New York City and 295 miles in New Jersey. This immense seaport handles nearly one fifth of the country's exports, about one fourth of its imports, and a vastly greater amount of coastal and intercoastal shipping

steep mountain walls leave no room for a city and bar easy communication with the interior.

Lagoons are produced by sand barriers or coral reefs. They are numerous in the southeastern United States. Galveston is an example of a lagoon harbor that has been improved to make it a splendid port.

Inland Cities Made into Ports

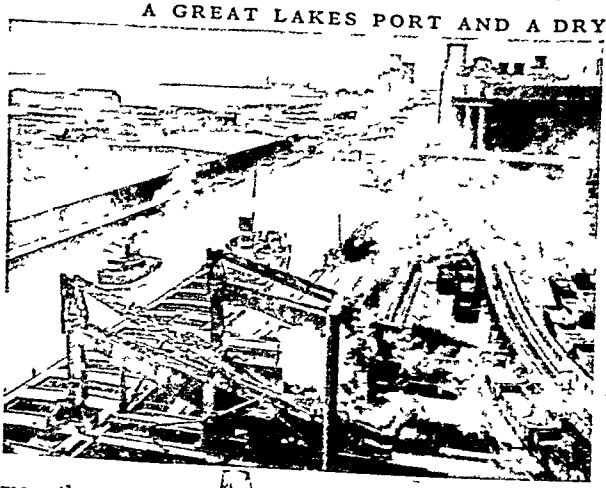
Inland cities have been transformed into seaports by dredged rivers and canals. Manchester, England, is connected with the ocean by the Mersey River and a canal 35 miles long, so steamers may unload cargoes directly into its mills. The largest ships reach Hamburg, Germany, 75 miles from the sea, because continuous dredging has deepened the channel of the Elbe to about 40 feet. Its vast harbor was made almost entirely by excavation. Houston, Texas, has a 35-foot canal bringing in ocean vessels. Chicago, 1,000 miles from the ocean, and other Great Lakes harbors receive shallow-draft ships via the St. Lawrence and Mississippi rivers and canal systems. The proposed St. Lawrence Seaway would bring in ocean liners.

The profits of commerce more than offset the immense expense of constructing artificial harbors. Tremendous breakwaters—great walls of stone or concrete or similar material—are built far out into the ocean to break up heavy seas and afford a safe refuge. Artificial harbors are made by such breakwaters. Dover, England, has one of the largest artificial harbors in the world. More than two miles of concrete breakwaters enclose a square mile of anchorage with a minimum depth of 40 feet. A two-mile breakwater protects the anchorage at Hilo, Hawaii, from northeast trade winds. Madras, India, on an open roadstead, has been made a port by extensive harbor works which protect ships against the monsoons.

Wet Docks and Dry Docks

In harbors where there is a great range of water depth between high and low tide, as at London, Liverpool, and Le Havre, it has been necessary to construct huge wet docks, or basins, usually made

A GREAT LAKES PORT AND A DRY DOCK



Buffalo's port, at left, handles a large share of the Great Lakes shipping. Here, where the New York State Barge Canal runs into Lake Erie, we see steam cranes with clam-shell buckets, for transferring iron ore from ships to cars, and giant grain elevators. When the floating dry dock, below, submerges, a vessel floats between its walls. The water is then pumped out, so the dock's floor can rise clear of the waves, and workmen repair the ship's hull, held steady by timber supports.



of concrete with gates that ma ntain the water level when he t de runs out

All great harbors are qu pped with dry docks and ther facilities for repairing hips and cleaning their hulls A dry dock is a large bas n built of concrete wh ch can be losed with watert ght gates fter a vessel has entered The water is then pumped out r allowed to run out w th he tide the ship being held pright by shores or long mber supports wh le work nen scrape mend or paint the ull Adjo ning the dry dock re repair shops

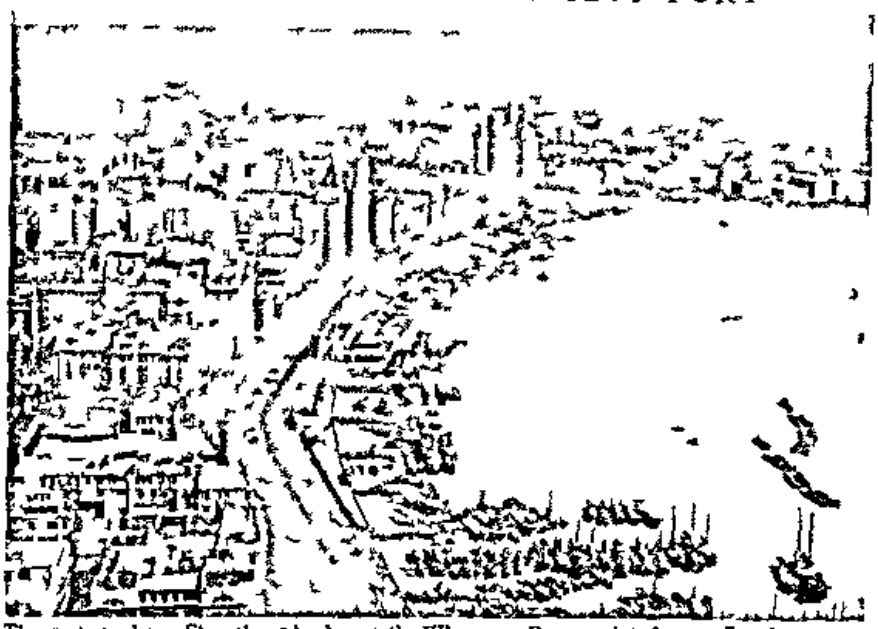
Good harbors need constant ttention Currents and t des ilt up old channels and open new ones Cont nuous dredg ng is necessary to ma ntain navi gable depths The increasing s ze of liners and the growing magn tude of trade are bringing repeated enlargements of port facilities At a cost of 6 m llion dollars Ambrose Channel into New York harbor was deepened to 40 feet at low tide and widened to 2 000 feet for seven m les The p er and wharf capacity were also greatly extended Other harbor facil ties are cont nually modernized and improved as they grow too old to handle heavy commerce effic ently

The large ports have m les of p ers and sl ps with enormous warehouses and all the most m proved devices for load ng and unload ng steamers—electric cranes automatic hoists endless belts an d pneumat c tubes and pumps which move such prod ucts as wheat or o l from the hold of a vessel to storage build ngs or to wa ting freight cars

The United States govern ment makes large annual appropriations for harbor maintenance and improvement Bes des the continual dredg ng new surveys are constantly being made and new charts prepared for the gu d ance of mariners L ghthouses lightships beacons buoys range finders rad o s gnals leader cables and other equip ment to guide ships through narrow winding harbor entrances in darkness or in fog must be in stalled improved and repa red if the ports are to be kept safe for nav gation (*See also* L ghthouses and Lightsh ps Navigat on)

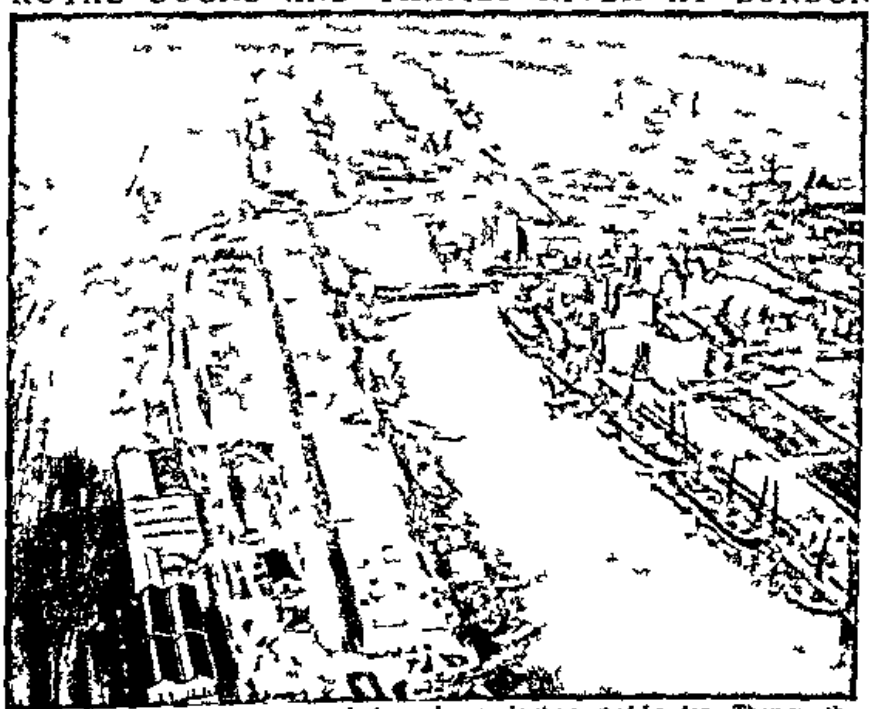
The making and ma ntenance of aids to nav gat on are dut es which belong to or have been assumed by the nat onal government but the provis on of ade quate terminal facil ties usually falls to state or city (*See also* Harbors and Ports in FACT INDEX)

SHANGHAI—CHINA S BUSIEST PORT



This p cture shows Shanghai s harbor on the Whangpoo R ver and ts famous Bund or water front The port is the outlet for China s rich Yangtze basin Foreign nat ons whose com merce he ped build the city gave up their concessions after the second World War

ROYAL DOCKS AND THAMES RIVER AT LONDON



Here we see three of the busy wet docks, or basins *in the port of London They are the* Victoria Docks in the foreground and the Royal Albert and King George V Docks beyond. *Huge gates at the entrance from the Thames River,* in the rear hold the water at a uniform level while the t de rises and falls in the Thames Sh ps pass into the basins through locks

In the WHITE HOUSE *after the First* WORLD WAR

HARDING, Warren Gamaliel (1865–1923) Few presidents have come into office with a more difficult task confronting them than that which faced the 29th president of the United States on his inauguration, March 4, 1921.

In the first place, owing to party differences, the Versailles peace treaty, in the negotiation of which President Wilson had taken part on behalf of the United States, had failed of ratification in the Senate. This left the United States technically in a condition of suspended warfare with Germany and Austria and with no share in the new League of Nations—which, indeed, had been the chief stumbling-block to the ratification of the peace treaty. Friends of Germany and Austria were resentful at the harsh terms imposed upon those countries; an irreconcilable group of Republican senators demanded the complete "scrapping" of the League of Nations covenant; humanitarians urged that the United States aid the suffering Armenians in safeguarding their new freedom against the massacring Turks; radicals demanded that Bolshevist Russia should be given a chance to work out its salvation, while reactionaries clamored for more stringent measures against "reds" of all sorts; jingo elements labored indefatigably for sterner measures against Japan and Mexico; and the "Friends of Irish Freedom" exerted every pressure that could be brought to bear to induce the United States to recognize the independence of "the Irish Republic."



WARREN G. HARDING

Serious Problems to Be Faced at Home

Domestic problems were equally pressing. Heavy taxation and the "high cost of living" were legacies of the war; and business demanded relief from the one while the buying public clamored for a lightening of the burdens of the other. A financial stringency and much unemployment accompanied the economic readjustment. Labor and capital were equally tenacious of advantages gained and resentful of losses incurred. The relinquishment by the Federal government of those powers of control over public necessities—such as food, fuel, and transportation—which it had perforce assumed during the war, carried with it no release from the exceptional problems arising out of these necessities in the transition to peace.

Warren G. Harding of Ohio, who was nominated for the presidency on June 12, 1920, by the Republican convention at Chicago, was a "regular of regulars," and his personality has been compared to that of his Ohio predecessor, President McKinley. He was born in Corsica, Ohio, where his father was a local physician. He was educated at Ohio Central College, Iberia, Ohio; became the publisher of the *Marion* (Ohio) *Star;* married in 1891 Florence Kling of Marion; was elected to the Ohio senate in 1900, and to the lieutenant-governorship in 1904. He was the unsuccessful Republican candidate for the governorship of Ohio in 1910; and in 1915 was elected to the United States Senate. As a member of the Senate Committee on Foreign Relations, he had favored the ratification of the peace treaty with reservations "sufficient to safeguard the interest of the United States of America."

The Campaign

Up to 1919 it was generally believed that Theodore Roosevelt would be the Republican candidate in 1920, but his death left the field open to others. Of these, Gen. Leonard Wood Senator Hiram Johnson of California, and Gov. Frank O. Lowden of Illinois were most prominent and had the most support among the Republican rank and file. Harding at the outset had few supporters, but when a deadlock ensued in the convention held at Chicago, the leaders agreed to his nomination. For the vice-presidency, the convention selected Gov. Calvin Coolidge of Massachusetts.

Several candidates competed for the Democratic nomination in the convention which met at San Francisco, but ultimately the choice fell to Gov. James M. Cox of Ohio, with Franklin D. Roosevelt of New York as the nominee for vice-president.

Neither Harding nor Cox had previously been figures of national interest, and their personalities and records played little part in the campaign. In the preceding January, President Wilson had asked for "a great and solemn referendum" upon the League of Nations, and this was outwardly the campaign issue but, in reality, it was whether or not the people approved the Wilson administration. The election resulted in a tremendous landslide for the Republicans. Harding received 404 electoral votes to only 127 for Cox, and a popular plurality of about 7,000,000 votes. For the first time since 1876 one of the Southern states, Tennessee, cast its electoral votes for the Republican candidates.

In his inaugural address, President Harding indicated that one of the main aims of his administration was to secure a return to "normalcy." To help achieve this process, he called Congress in special session in April 1921, and a number of important measures were passed, including the adoption of a national budget

system, the passage of a joint resolution declaring the war with Germany and Austria at an end, and the enactment of acts revising the tariff and further limiting immigration The immigration act provided that the number of aliens who could in any one year enter the United States should not exceed three per cent of the persons of that nationality resident in this country in 1910 (*see* Immigration) The first tariff act passed was an emergency measure and it was superseded in 1922 by the Fordney McCumber Act which provided the highest duties in United States history

Foreign Policies

In foreign affairs President Harding s policy was to keep the United States from becoming involved in European politics During the campaign his position on the League of Nations issue had been equivocal but after his inauguration he made it clear that he was definitely opposed to entering the League The administration withdrew the American unofficial representatives on the Reparation Commission and refused to have any formal part in League deliberations American troops in Germany were gradually withdrawn and in January 1923 the last of them were ordered home

President Harding did not however, share the views of those who favored complete American isolation He repeatedly expressed his desire to strengthen the bonds of friendship between nations and to promote peace He urged American participation in the Permanent Court of International Justice at The Hague and called an international conference to meet at Washington in November 1921 to consider naval reduction and certain Pacific and Far Eastern questions The principal naval powers invited were Great Britain France, Italy, and Japan Invitations were also sent to China, and to certain smaller European powers such as Belgium, Portugal, and the Netherlands, who had interests in the Far East

The idea of the Washington Conference was received with great enthusiasm, and the nations were represented by eminent statesmen, notably Balfour of England, and Briand of France President Harding himself welcomed the delegates, but the actual course which the United States took was directed by Secretary of State Charles E Hughes With a boldness seldom seen in a diplomatic meeting he proposed that there should be a naval holiday for ten years His plan stipulated that a large number of ships in the navies of the United States, Great Britain and Japan should be scrapped, and that the ratio in power in capital ships between these nations should be 5-5-3 respectively Differences of opinion naturally developed over the various details of this proposal but several important agreements were finally reached

Results of the Washington Conference

This conference was the most conspicuous achievement of President Harding s foreign policy It resulted in an agreement between the United States, Great Britain and Japan accepting the naval holiday plan and the 5-5-3 ratio, and providing for the scrapping of over threescore vessels Italy and France also agreed to limit their capital ships to a strength about one-third that of the United States and Great Britain Restrictions were imposed upon the use of submarines and the use of poison gas in warfare was forbidden

Another treaty between the United States Great Britain France and Japan bound them to protect one another s rights to their insular possessions in the Pacific and in cases of disagreement that could not be settled by diplomacy to submit the dispute to a conference Two more treaties between these powers including also Belgium China, the Netherlands and Portugal provided for the maintenance of China s territorial integrity and sovereignty, and the principle of the "open door" Japan also agreed to withdraw from Shantung No agreement was reached regarding cruisers and other subordinate naval craft and this later resulted in a serious diplomatic controversy

HARDING S ADMINISTRATION
1921–1923

- Budget Bureau established
- Treaty ratified giving Colombia $25 000 000
- Bill passed restricting immigration
- Peace with Germany and Austria declared (July 2 1921)
- Washington Conference on Limitation of Naval Armament
- Strikes of Coal Miners and Railroad Shop Workers (1922)
- Fordney McCumber Tariff Act restores High Protection
- Soldiers' Bonus Bill vetoed
- Republicans lose 14 seats in the Senate and 150 in House
- Investigation of Teapot Dome Oil Lease Scandal begins
- Last of American Troops on Rhine ordered home (1923)
- Death of President Harding (1923)

During the war prices had risen to unprecedented levels, and an orgy of speculation soon followed the armistice Money was obtainable at easy rates and people failed to realize that with a large part of the world impoverished by strife the seeming prosperity of the United States could not last Land prices in various parts of the country especially in the middle west and northwest were doubled tripled even quadrupled, and speculation was rampant in many industries Before the end of 1920 the inevitable deflation began, bringing hard times and financial ruin to millions.

The Farmers Problems

Clamorous demands for government relief were raised, especially by the 'farm bloc," an informal non partisan organization of congressmen especially interested in the problems facing agriculture A number of measures designed to aid agricultural interests were passed but none was very helpful By 1923 business was making a steady return to normalcy, but the farming conditions throughout the United States continued unstable and various remedies were proposed A number of things combined to make the farming situation acute One of these was the substi-

tution of motor power for horse power on the farms. The number of horses and mules used on the farms decreased by the million, and tens of millions of acres of land that would have been required to raise and feed such animals were used for other purposes. The expansion of the production of wheat, cotton, and foodstuffs, stimulated by the high prices and the great demand from Europe during the first World War, produced a surplus on the world market. The farmers were reluctant to reduce their acreage. The result was a fall in the price of farm products and lands.

The effects of hard times and the usual backward swing of the political pendulum were evident in the congressional elections of 1922. The Republican majority in the Senate was cut from 24 to 10, and in the House from 165 to 15.

President Harding's cabinet contained Charles Evans Hughes, Herbert Hoover, and other men of great ability and integrity. Unfortunately some members of the Cabinet were not so admirable. Early in the administration, the President approved the transfer of certain government oil lands at Elk Hills in California and Teapot Dome in Wyoming from the Navy Department to the Department of the Interior. These oil lands were then leased to the Doheny and Sinclair interests. There was nothing essentially dishonest in such a transaction, though the leasing of such lands was opposed by conservationists. Later, however, it was revealed that after granting these leases, Albert B. Fall, secretary of the interior, received large sums of money under the pretense of "loans." The disclosure of these and other facts aroused popular indignation. In the meantime, Fall had resigned from the Cabinet and was therefore beyond the power of impeachment. However, he was later prosecuted and after long delays ultimately convicted for his part in the affair. Doheny and Sinclair were also brought to trial but escaped conviction, though Sinclair served a jail term for contempt of the Senate. Cancellation suits were also brought—on the ground that the leases had been obtained by fraud—and won, the oil lands being restored.

Public distrust also fell upon Attorney-General Harry M. Daugherty because of his share in transferring the oil leases and because of certain other activities. The accusations against him were felt to be the more serious because he was a close friend of the President and had managed his campaign. After the death of President Harding, and at the demand of President Coolidge, Daugherty resigned. He was tried for conspiracy with the alien property custodian, but the jury disagreed, and the case was dismissed.

President Harding was spared the humiliation of most of these revelations. In June 1923, with his wife and a large party, he set out on a tour of the West and Alaska. On his return to Seattle he was taken ill. He was removed to San Francisco and while apparently recovering, he died of an apoplectic stroke on the evening of August 2. His body was taken to Washington for the state funeral, and afterwards to a mausoleum at Marion, Ohio. President Hoover, upon the dedication of the Harding tomb in 1931 said "Warren Harding had a dim realization that he had been betrayed by a few of the men whom he had trusted, by men whom he had believed were his devoted friends. It was later proved in the courts of the land that these men had betrayed not alone the friendship and trust of their stanch and loyal friend, but they had betrayed their country. That was the tragedy of the life of Warren Harding."

Harding was not a great president, though under him the difficult period of reconstruction was successfully passed, the national budget was balanced, the national debt reduced, and a return to something approaching "normalcy" effected. He himself made no claims to greatness; he said that if he possessed any particularly useful quality it was that of helping people to "march in step."

HARDY, THOMAS (1840–1928). Although the books of this great tragic novelist are too gloomy and pessimistic to be "popular," he is one of the few writers whose works have been accepted as classics in their own lifetime. Born near Dorchester in Dorsetshire, England, he passed most of his long life, as did his ancestors before him, in that region of woodland and heath and moor which he calls by its old name "Wessex" and which forms the setting of most of his writings. He was educated at local schools and by private tutors and for a time studied at King's College in London. At 16 he began the study of architecture and at 22 went to London as assistant to an architect. He had already begun to write and for a time was uncertain whether to make architecture or letters his profession, but after his first really successful novel, 'Far from the Madding Crowd', was published in 1874, he decided to retire to Dorsetshire and devote himself to literary work. Doubtless architecture had much to do with his wonderful constructive power.

Hardy was interested in the simple primitive men of the countryside with their strong elemental instincts and passions. Still more was he concerned with nature in all its moods and changes, not only as the great background against which man moves onward to his destiny, but as a power entering the very life of man, sometimes sympathetic, more often cruel.

What Meredith called his "twilight view of life" gives to most of his work an atmosphere of melancholy and pessimism. Though it is thoroughly modern in the realism with which it depicts common life, even in its ugly and sordid aspects, it is like that of the old Greek dramatists in presenting the innocent or helpless as victims of relentless fate. This makes Hardy's 'Tess of the D'Urbervilles' one of the most terrible as well as one of the most artistic of all novels.

Hardy's chief novels are: 'Under the Greenwood Tree' (1872); 'Far from the Madding Crowd' (1874); 'The Return of the Native' (1878); 'Tess of the D'Urbervilles' (1891). 'Jude the Obscure' (1895); 'The Well-Beloved' (1897); 'A Changed Man' (1913). His poetry includes 'Wessex Poems' (1898) and 'Time's Laughing-stocks' (1909). 'The Dynasts' (1903–1908) is an epic drama in three parts.

HARGREAVES, JAMES (1730?–1778) The obscurity of James Hargreaves life contrasts sharply with the world wide importance of his invention the spinning jenny Almost nothing is known of his life Probably he was born at Blackburn in Lancashire England and while still a boy, he was a carpenter and spinner in Standhill a village nearby Then as now Lancashire was the center of England s manufacture of cotton goods The industry however was still confined to workmen s homes and the cards spinning wheels and looms were operated by hand

The story goes that an accident gave Hargreaves the idea for his spinning jenny In his crowded cottage which served h m both as home and workshop he had been experimenting with spinning two threads at one time His experiments were unsuccessful however because the horizontal spin lles allowed the threads to fly ap art and become tangled Then one of his chil lren upset the experimental machine and its wheel continued to revolve with the spindles in a vertical posi tion While watching the upset machine it occurred to Hargreaves that a machine with spindles in this posi tion might be successful He proceeded to build a spinning machine probably in 1764 that would spin eight threads at once He called it a spinning jenny for reasons that are no longer known

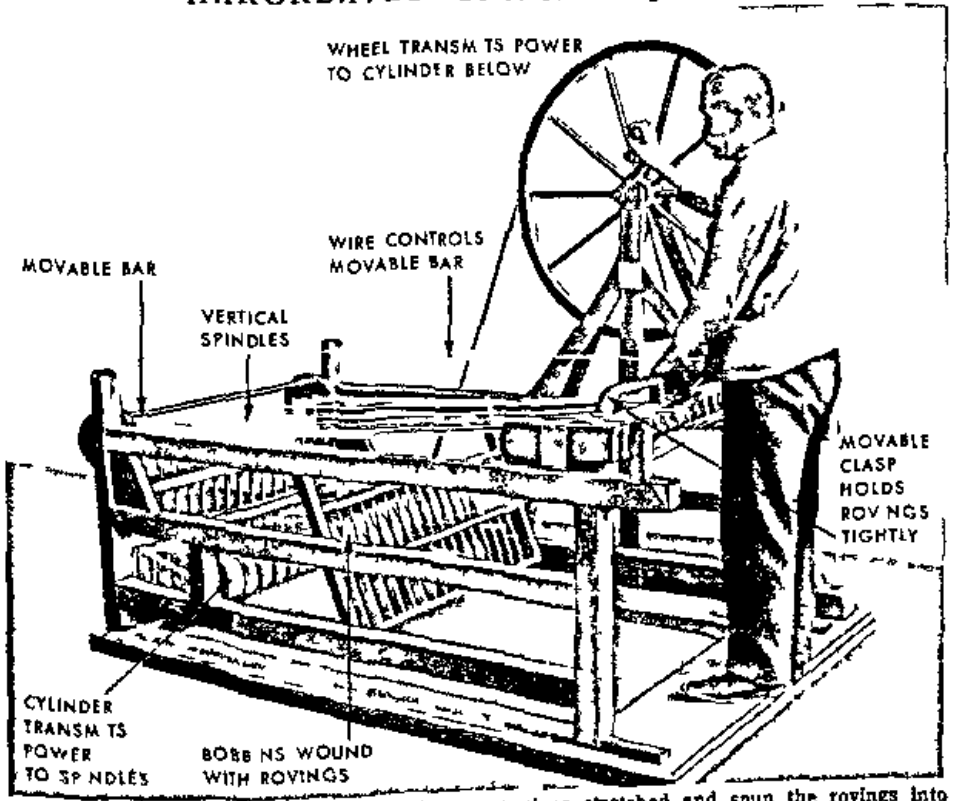
The amount of cotton yarn he and his children began to turn out alarmed other spinners who feared that Hargreaves machine would put them out of work so they broke into his home and destroyed his machine He moved to the town of Nottingham where he set up a fairly profitable yarn mill and in 1770 he patented the spinning jenny As he had previously sold several of his machines the patent was declared void when brought to a test This left others free to use the invention without paying him royalties and consequently the jenny came into wide use The production of cotton yarn increased vastly Even during his lifetime jennies were built to spin as many as 80 threads at once

Other inventors were also at work in solving the same problem and before Hargreaves death in 1778 mechanical spinning was fully developed by Richard Arkwright and Samuel Crompton Somewhat later this revolution was completed by Edmund Cartwright who invented the mechanical loom (*See also* Arkwright Crompton Cartwright)

HARMONICA Learning to play the harmonica or mouth organ is relatively easy and is a good way to start a musical educat on Many former harmonica players are now members of symphony orchestras performing on string and percussion instruments as well as wind instruments The harmonica is a *free-reed* instrument and hence is related to the accordion and reed organ In these instruments the tones are produced by flexible brass reeds Each reed swings freely in a narrow slot rather than vibrating against the sides of an aperture as in such instruments as the clarinet

Three general types of harmonicas are manufactured today The *plain harmonica* has ten holes each of which produces two tones of the scale One tone is sounded by blowing through the hole the other by drawing breath through it Since the mouth usually covers four holes three of these are stopped off by the tongue Tl e scale is played by alternately blowing and sucking in breath at each of the holes in turn Removing the tongue from the stopped holes results in a chord The *concert harmonica* is similar to the plain harmonica except that an upper bank of holes produces the octaves of the lower bank *The two banks are* played simultaneously

HARGREAVES SPINNING JENNY



Spinning with the jenny was an intermittent operation To set up his machine the operator ran *rovings* (loosely twisted yarns) *from the* bobbins through the clasp to the spindles Then while turning the b g wheel he drew the clasp back to the position in which it is shown here These motions *stretched* and spun the rovings into thread Finally he lowered a bar over the threads while pushing the clasp all the way forward With the threads thus held *down the spind es* wound them up instead of twisting them. These operations were then repeated.

Both these types of harmonicas produce only the simple major scale. Consequently instruments are manufactured in a variety of scales, the harmonica in C being the most widely favored.

The *chromatic harmonica*, the third general type, may be played in any key. It has an upper and lower bank of holes tuned a semitone apart. The two banks are separated by a slider that stops off one bank at a time. This is operated by a knob at one end of the instrument. By blowing in and out on each of the holes and using the slider, the performer can sound the full chromatic scale. Very large and very small harmonicas and harmonicas of special design are made for the use of harmonica bands, but all these conform in general to the types described here.

The harmonica was probably invented by Sir Charles Wheatstone, the British scientist, and was first manufactured in 1829. It was then called the *aeolina*. German manufacturers produced the instrument in quantities and popularized it in Europe and in the United States.

A totally different instrument, invented in the 17th century and improved by Benjamin Franklin, was also called a harmonica. Franklin's harmonica consisted of a number of glass bowls, each tuned to a note and fastened on a long spindle that was made to revolve by working a treadle. The sounds were produced by resting the fingers on the rims of the turning glasses. Playing these musical glasses was a fashionable accomplishment for a time, and music for them was written by Mozart, Beethoven, and others.

HAROLD, KINGS OF ENGLAND. Only two kings of England have borne the name Harold. Both of them reigned before the Norman Conquest (1066).

HAROLD I (ruled 1035–1040) called **Harefoot,** was a son of the Danish king Canute, who ruled Denmark and Norway as well as England (*see* Canute). When Canute died, Harold claimed the English crown in opposition to his half-brother Harthacanute, who happened to be in Denmark at the time. On Harold's death, Harthacanute succeeded to the English throne but died two years later while attending a wedding feast.

HAROLD II (born 1022?, ruled in 1066), the last king of the Anglo-Saxon period, reigned only nine tempestuous months. He was the son of the powerful Earl Godwin and was himself Earl of East Anglia and of Wessex before he was chosen king, succeeding the childless Edward the Confessor.

Hardly had Harold come to the throne, in January 1066, before he was compelled to take his army north to face an invading Norwegian force. After his victory he soon had to hasten south to face another invading army under William, Duke of Normandy (*see* William I, the Conqueror). Harold met William at Hastings and fell on the field of battle (*see* Hastings, Battle of).

William based his claim to the English throne on a promise he declared he obtained from Harold while Harold was in Normandy in the days of Edward the Confessor. The famous Bayeux tapestry shows Harold taking the oath to support William. We cannot be sure of this incident because the tapestry was made by Norman women and doubtless presents William's claim in as strong a way as possible. (*See also* English History.)

HARP. The graceful shape and beautiful tones of the modern harp are the result of several thousand years' development, for the harp is one of the oldest of musical instruments. The modern orchestral harp is roughly triangular in shape. The strings are stretched between a tapered sounding board, which rests against the player, and a curved bracket at the top of the instrument. Connecting the bracket and the base of the sounding board is a hollow upright pillar. Through this pillar pass rods, worked by pedals at the base of the harp, by means of which the pitch of the strings is raised.

By the use of the pedals, the harp may be played in any key. There are seven pedals, each governing one note of the scale and its octaves. If a pedal is pressed halfway down, the note is raised a semitone; if pressed fully down, it is raised a full tone. At one side of the grooves in which the pedals work in the pedestal of the harp are two notches; the pedals are hitched into these when they are used. The modern harp usually has about 46 strings, and each of these is capable of producing three tones. The instrument, accordingly, has a very wide range. When no pedals are used, the orchestral harp sounds in the key of C flat major.

History of the Harp

The idea of the harp may have originated with the bowstring, which often gives out a pleasant musical note when it is plucked. It is easy to see how some musically inclined hunter may have added other strings of different lengths, thus producing an instrument on which simple melodies could be played.

An old Greek legend credits the god Hermes (Mercury) with the invention of the cithara, or lyre, a harplike instrument of ancient times. According to the myth he made the first lyre from a tortoise shell a few hours after his birth. The great antiquity of the harp is shown by Egyptian tomb paintings. Thousands of years old, these pictures depict the harp in various stages of development, from a form resembling the hunter's bow to elaborately carved triangular instruments resembling the harp of today. Much like these were the harps used by the ancient Hebrew people in their religious ceremonies. The old Irish harp was a small instrument of limited compass. This harp and the similar Welsh harp have been revived in modern times.

In the 18th century the harp was greatly improved by the addition of the pedals. These were invented by Sébastien Érard (1752–1831), a French manufacturer of musical instruments who was also noted for his improvements upon the piano. By perfecting the harp in this and other ways, Érard greatly increased its capabilities for orchestral use. Now the great scores of Meyerbeer, Gounod, Berlioz, Liszt, and Wagner are not complete without it.

The harp is one of the most difficult instruments to play and skillful harpists are rare But to evoke its beautiful tones repays long hours of patient study for its music has a special depth and clear haunting richness

HARPERS FERRY W Va Little Harpers Ferry is only a village but it is one of the most famous places in the United States It was the scene of John Brown s Raid in 1859 (*see* Brown John) The village owed both its growth and its decline to its strategic position

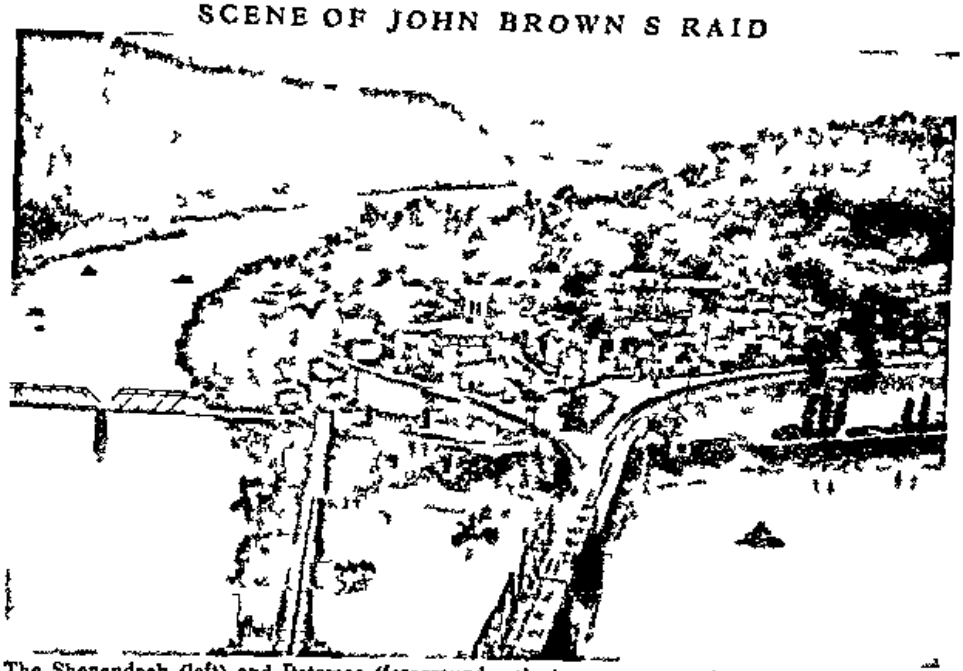
It stands on a narrow tongue of land at the junction of the Shenandoah and Potomac rivers Here the states of West Virginia Virginia and Maryland meet Although surrounded by heights Harpers Ferry is on the lowest land in West Virginia The abundant water power at Harpers Ferry led the United States in 1796 to establish an arsenal there This arsenal was the objective of John Brown s unsuccessful raid Because the site provided a natural pass through the Blue Ridge Mountains the town was an important military objective during the Civil War It was occupied at various times by both Confederate and Federal troops (*see* Civil War American) During the war its railroad bridge was destroyed and rebuilt nine times By the end of the war the town was in ruins The government arsenal was never reopened

Today the historical relics at Harpers Ferry attract many visitors The oldest building is the home built by the ferryman Robert Harper who founded the town in 1734 as Shenandoah Falls In 1763 the Virginia Assembly changed the name to Harpers Ferry On the campus of Storer College a Negro coeducational school is the reconstructed room of the arsenal where Brown fired his last shots

Jefferson s Rock high above the town gives a view of three states Thomas Jefferson visited there in 1801 and described it as one of the most stupendous scenes in nature and worth a voyage across the Atlantic Population (1950 census) 822

HARPIES In ancient mythology the harpies were conceived as repulsive creatures—birds with the faces of old women the ears of bears and crooked talons One legend relates how Phineus king of Salmydessus in Thrace deprived of his sight by the gods for his ill treatment of his sons or for revealing the future to mortals was condemned to be tormented by two harpies who snatched away whatever food was placed before him and devoured it In Homer their function is to carry off to the underworld or to some spot beyond human ken those whose sudden disappearance is desired by the gods The name harpies means the robbers and they are supposed to be a personification of the storm winds

SCENE OF JOHN BROWN S RAID



The Shenandoah (left) and Potomac (foreground) join to carve a gap through the Blue Ridge Mountains at Harpers Ferry W Va Here the abolitionist John Brown directed his fu e raid in 1859 The highway and railroad bridges in the foreground cross the Potomac to Marvland

HARRIS JOEL CHANDLER (1848 1908) One character in American literature has endeared America to countless people of other countries He is the Brer Rabbit of Joel Chandler Harris Uncle Remus stories Joel Chandler Harris like Brer Rabbit himself was born and bred in de brar patch The town was Eatonton in the center of Georgia the time Dec 9 1848 some 12 years before the Civil War began The boy never knew his father who died before Joel was born He lived with his mother and grandmother and knew from early boyhood what it was to be poor He had red hair and freckles A slight stutter in his speech made him shy but he was champion at all the games the boys played and at stealing watermelons

There was no public school in the town but a kind neighbor paid his tuition to an academy and he held his own with the other students But Joel Chandler Harris received his greatest education from the people and the creatures he encountered outside the school room He was always fond of animals hunting dogs and horses in particular and birds held a special fascination for him He liked to listen to people talk —the Negro slaves he encountered and the old lawyer Mr Deometari who had come from Greece and who let Joel rummage at will among the books he had in his office The post office and general store however was his favorite haunt Here he sat on the only safe corner of a faded green sofa tilted against the wall and watched and listened to the townspeople who called for their newspapers and letters and

bought their supplies there. The postmaster piled up the weekly newspapers on a long shelf, where each subscriber could help himself. Joel went to the post office every Tuesday and sat there reading other people's newspapers as long as they lasted.

Apprentice Days on a Newspaper

One day Joel read an announcement which said that a new weekly was to be published nine miles from Eatonton. It was to be called *The Countryman* and was to be modeled after the famous English paper, *The Spectator* of Joseph Addison and *The Bee* of Oliver Goldsmith. Joel knew the name of Oliver Goldsmith, because 'The Vicar of Wakefield', from which his mother read aloud, was his favorite book. He waited eagerly for that new weekly, and was promptly on hand to read the first copy. It was so interesting that he read every word of it, advertisements and all. And suddenly, among the want ads he saw:

Wanted An active, intelligent white boy, 14 or 15 years of age is wanted at this office to learn the printing business.

Joel borrowed a pencil from the storekeeper and wrote out the answer. The next time the publisher of *The Countryman* came to Eatonton, he looked up Joel Harris and told him to get ready to go with him to the plantation. The boy put away his top and his marbles, "packed his belongings in an old-fashioned trunk, kissed his mother and grandmother good-by, and set forth on what turned out to be the most important journey of his life."

JOEL C. HARRIS



Harris created the Negro storyteller, Uncle Remus.

Joseph Addison Turner was the name of the plantation owner and the publisher of *The Countryman*. Turner became a great influence upon Joel's life. He taught him how to set type, encouraged him to write on his own when he discovered Joel's bent in that direction, gave him the freedom of his library, which was a very fine one, and advised him in his reading. He gave him time to roam the woods and the cabins of the Negroes whenever his tasks in the printing shop were done. He gave him his own colt Butterfly to break and ride.

BRER RABBIT CAPTURES BRER WOLF



This is one of the A. B. Frost illustrations for 'The Awful Fate of Mr. Wolf' by Joel Chandler Harris. Brer Wolf is in the locked chest.

This was the world from which Joel Chandler Harris got his education. This was the world in which he had time to learn the rich folklore of the Negro, to love and respect it, and to catch and store up with his inner ear every sound and cadence of their rich, individual speech. For four years Joel Harris was part of that world until it ended when the Civil War was over.

The Beginnings of Uncle Remus

After the war, Joel Chandler Harris went to Macon, Ga., then to New Orleans and finally to Savannah, on newspaper assignments. At Savannah he married Esther LaRose, the daughter of a French Canadian whom he had met in a boarding house. But in 1876, when the yellow fever epidemic broke out, the Harrises left Savannah and Harris joined the staff of the Atlanta newspaper *The Constitution*. He wrote special articles—anything from puns to editorials. One day, when another writer who had been writing a series of Negro sketches failed to turn in his copy, the editor of the paper said, "Joe, can't you carry on this series?" Joel Harris had his own idea of how the Negro should be represented, and he followed his own plan.

The result was the first Uncle Remus story of "The Wonderful Tar Baby." It came straight from the good years at Turnwold, the Turner plantation, from long sessions with old slave, George Terrell, and it was the beginning of an authentic, completely sincere, and intuitive appreciation of the folklore of the Negro people. Joel Harris gave that folklore a literary form which has never been matched.

In this manner *Uncle Remus* came into being, to be acclaimed as enduring literature the world over. Presidents and millionaires, men, women, and children beat a path to Snap Bean Farm, the tree-surrounded home of the Harrises to pay homage to Uncle Remus. Joel Chandler Harris refused to be lionized. He said it was an "accident" that he had created one of the rarest pieces of Americana. He did consent to go to the White House to visit Theodore Roosevelt because the Roosevelt children demanded to know him. But to the end of his days he held to his own great simplicity, surrounded by his children and his grandchildren, writing the Uncle Remus stories to the glory of American letters.

It was not until the first volume of 'Uncle Remus' was fifteen years old that the stories were to find their definitive illustrator. In 1906 A. B. Frost

brought the beloved characters to life in an edition which was dedicated to him

Joel Chandler Harris died on July 3 1908 His home which was called Snap Bean Farm or The Wren s Nest, because a wren once built a nest in the mailbox, is maintained as a memorial to him

Editions and Biographies

Harris books with their original publishers and dates of publication are Daddy Jake the Runaway and Other Stories (Century 1901) Little Mr Thimblefinger (Houghton 1894) Mr Rabbit at Home (Houghton 1895) Nights with Uncle Remus Myths and Legends of the Old Plantation (Fichnor 1883 Houghton 1904) On the Plantation (Appleton 1892) Tar Baby and Other Rhymes (Appleton 1904) Told by Uncle Remus New Stories of the Old Plantation (McClure 1905) Uncle Remus and His Friends (Houghton 1900) Uncle Remus His Songs and His Sayings (Appleton 1900) A good modern edition is The Favorite Uncle Remus, *edited by* George Van Santvoord and Archibald C Coolidge (Houghton 1948) Joel Chandler Harris Plantation Storyteller by Alvin F Harlow (Messner 1941) is a biography for younger readers

HARRISBURG, PA The capital of Pennsylvania began in the early 1700 s as an Indian trading post on the Susquehanna River Here early settlers operated a busy ferry as pioneers pushed westward through the Blue Mountains During the 1800 s Harrisburg flourished as a river port and then as a railroad center Today the city is still an important hub of transportation Two railroads maintain large freight classification yards and seven national highways intersect here The city is served by the eastern section of the Pennsylvania Turnpike (*see* Pennsylvania) Several airlines call at its airport

Nearby coal and iron mines furnish Harrisburg with raw materials for its largest industry making steel Coal is available even at the city's doorstep The Susquehanna washes tons of coal down from the mountains to Harrisburg, where dredges pump it from the river bed The largest steel rail mill in the country is here Other industries are food processing printing and publishing and the manufacture of clothing

Capitol Park the center of governmental activities contains the impressive group of state buildings Towering above them is the green dome of the main capitol building The State Capitol was completed in 1906 Its bronze doors statuary mural decorations and stained glass windows are noteworthy features Other state buildings here are the Museum and the Finance Building The Forum a large civic auditorium is in the Education Building Beautiful River Park extends four miles along the river highway

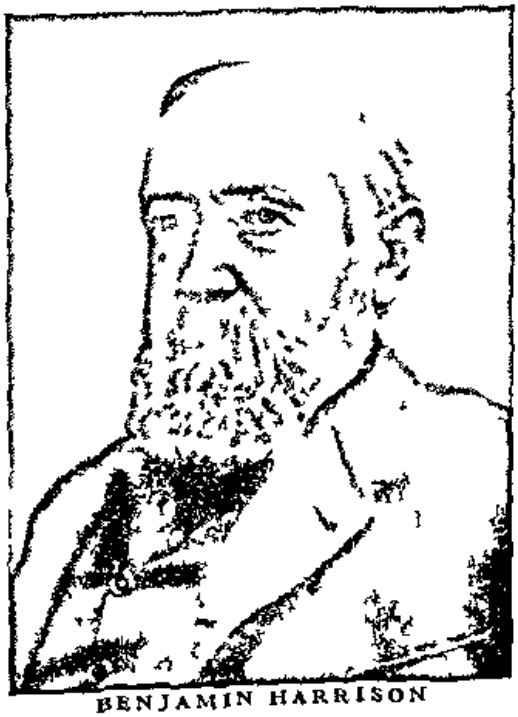
In 1785 John Harris marked out the site for a village he named Harrisburg in honor of his father The elder Harris had established the first trading post here about 1712 Harrisburg became the state capital in 1812 and received its charter as a city in 1860 It adopted the commission form of government in 1913 Population (1950 census) 89 544

PRESIDENT *and Grandson of a* PRESIDENT

HARRISON, BENJAMIN (1833–1901) 'And grandfather s hat fits Ben' was the refrain of one of the popular election songs of 1888, when Gen Benjamin Harrison of Indiana was elected president

The grandfather was William Henry Harrison hero of Tippecanoe and president in 1841 The grandson Benjamin was a brigadier general of the Civil War, who became one of the ablest lawyers of Indiana and had been senator from that state, 1881–87

There was something of a mystery in the fact that Benjamin Harrison was for any reason at all elected president of the United States He was not a 'hand-shaking' politician and had never been active as a party worker When he stood on a platform and addressed a public audience he was one of the clearest and soundest speakers of his day *The audience* forgot that he was short and unimpressive with a large head resting immediately upon his shoulders They forgot that disrespectful reporters called him a 'pouter pigeon" They went away believing him to be a statesman But when he sat at a desk and dealt with men as individuals, his cold manner and seeming indifference often turned them against him Even when he granted men favors they went away dissatisfied His reserved manner and his reluctance to use dictatorial methods limited his influence with members of Congress and left the leadership of his party in other hands during his administration Yet no man ever had more loyal or devoted friends



BENJAMIN HARRISON

Election of 1888

Harrison was nominated by the Republicans in 1888 because the nominating convention was deadlocked by the attitude of James G Blaine who was the real leader of the party Blaine the nominee of 1884, had been beaten by Grover Cleveland and was unwilling to run again His friends stood out long hoping that he would reconsider When they had to give him up, they demanded a man who had few political enemies,

whose private life was above any suspicion of reproach, and who could be expected to carry the doubtful states of Indiana and Ohio. Harrison met these tests. His family went back to Benjamin Harrison, member of a distinguished colonial family of Virginia, who was active in the Continental Congress, a signer of the Declaration of Independence, and governor of his state. William Henry Harrison, long governor of Indiana Territory and Indian fighter, had been elected president in the thrilling campaign of 1840. The name was well known.

Benjamin Harrison, with this family background, had lived a useful life. Educated in a log schoolhouse at North Bend, Ohio, and at Miami University (1852), he practised law in Indianapolis before he went to war in July 1862 as a second lieutenant. He served ably in Kentucky and Tennessee, took part in the march on Atlanta, and left the service as brigadier general, promoted for "ability and manifest energy and gallantry."

The election of 1888 turned sharply on the tariff issue, which had been rising in prominence since the campaign of 1880 (*see* Tariff). For years the Democrats had argued that a protective tariff was only a form of favoritism to a wealthy and sectional class, and President Cleveland had demanded a tariff for revenue only. The Republicans, on the other hand, insisted that prosperity in the United States depended upon the economic independence that came from a protected system of manufactures. They carried the election in 1888, in spite of lukewarm interest in the Republican states of the West, where the voters thought the government protected the rich in the East and gave little thought to the farmers, and in spite of demands from workingmen that something ought to be done to ease their life and protect them in the uneven competition between the trusts and the workers.

Harrison was elected, and with him Levi P. Morton of New York as vice-president. Harrison won the majority of the electoral college (233 out of 401), but received fewer popular votes than did Cleveland, the Democratic candidate. The Republicans also carried both the Senate and the House, and were able in the next (the 51st) Congress to pass any party measures upon which they could agree. This was the Congress in which Speaker Thomas B. Reed won the title of "czar" because of his rulings to increase the efficiency of the House and to frustrate such tactics of the minority opposition as the refusal to answer roll call and thus prevent a quorum.

The President soon discovered how difficult it was to perform his duties when he was not the real leader of his party. He chose the real leader, Blaine, to be secretary of state; and the latter resumed with enthusiasm the tasks he had started eight years before under Garfield. Critics prophesied that Blaine would dominate the President, but their predictions for the most part were not fulfilled. Furthermore Blaine's frequent illness led Harrison to assume a considerable share of the work in State Department negotiations. The others in the cabinet were men of minor political importance. One, in the newest seat, was Jeremiah Rusk of Wisconsin, thrice governor there and always known as "Uncle Jerry," who was secretary of agriculture. Another was John Wanamaker of Philadelphia, head of a great department store and superintendent of a Sunday school, whose presence in politics and whose business were both good illustrations of the times.

ADMINISTRATION OF BENJAMIN HARRISON 1889–1893

James G. Blaine, Secretary of State.
"Reed rules" adopted in the House (1890).
McKinley Tariff Act, Sherman Anti-Trust Act, Sherman Silver Purchase and Coinage Act passed (1890).
Pension expenditures greatly increased.
North Dakota, South Dakota, Montana, Washington, Wyoming, and Idaho admitted as states (1889–90).
Territory of Oklahoma opened to settlement (1889).
First Pan-American Conference held in Washington (1889–90).
Bering Sea controversy with Great Britain settled (1893).
Controversies with Italy (Mafia troubles), with Germany (over Samoa), and with Chile.
Reciprocity treaties with Spain and Brazil.
Annexation of Hawaii fails.
People's Party (Populists) organized (1891).
Harrison defeated by Cleveland for re-election (1892).

Business Changes

John Wanamaker, as treasurer of the Republican campaign committee, had raised money, perhaps $400,000, for the campaign fund, by persuading his manufacturing friends that if the Democrats won the election they would reduce the tariff, and the manufacturers would lose their profits. Senator Matthew S. Quay, who managed the campaign, asked to have him made postmaster-general as a reward. This was done, and the Postoffice Department was the better for having a chief who was accustomed to big business transactions. Wanamaker did not please the civil service reformers, but he helped to launch rural free delivery, which made life more comfortable for farmers in remote places. He also worked hard in favor of postal savings banks and parcel post, which came later.

Wanamaker was best known as a storekeeper. He, Marshall Field of Chicago, and Alexander T. Stewart of New York had devised and applied changes in retail trade that produced the modern department store. Among them they broke down the old motto of *caveat emptor* ("let the buyer beware") which had always prevailed in business, and introduced the new practise of "money refunded," which has now become general. They gave a guarantee that their goods were

as represented They adopted the principle of the fixed price with the price plainly marked on every article and did away with the barter that had made shopping a risky sport for buyers They also gathered under one roof a multitude of different shops each a department in a great store instead of being a separate specialty shop and by wholesale buying cut down their costs

These men made huge fortunes for themselves their millions bulking large beside the estates of the bankers the railroad magnates and the manufacturers They could not have grown and flourished except in the great cities But there were then in 1890 three cities of over a million each New York Chicago and Philadelphia and one-third of the people of the United States were living in cities of 8 000 or more

Soon another type of fortune also a growth of the city was to join them This was the franchise fortune made by serving the traffic needs of the people of the cities as they went to work and of the adjacent country as it became possible to live in the suburbs There had been street-cars since the time of Jackson and elevated railways in New York since Hayes The electric trolley speeded the business Since no line could be built without permission (*franchise*) from the city government this change brought a new temptation into city government In many cities a bribe for one or more officials was the price of a franchise Meanwhile the various banking houses added to their millions since they arranged the financing for the street railway corporations

The Increase in Luxury

John Wanamaker was one of the rich who combined the accumulation of millions with a life of austere and sincere piety But some of the new millionaires were less restrained The lavishness of life increased with the more money to spend and more luxuries to buy The cities grew more elegant better paved better lighted magnificent hotels became temporary homes for the rich and those who wished to appear rich While Harrison and Wanamaker were in office the Astor family which had built a palace on Fifth Avenue New York only a few years earlier tore down the home and erected in its place the Astoria Hotel Soon this became the Waldorf Astoria and for a generation until it was replaced with the 102 stories of the Empire State Building in 1931 it remained the most celebrated hotel in the United States

The Fifty first Congress

In the 51st Congress there was much work to be done for there had not been a government under the complete control of one party for many years First of all was the tariff which the Republicans had promised to raise so as to protect any industry that needed protection William McKinley son and grandson of Ohio iron manufacturers gave his name to the bill that was passed in the autumn of 1890 There were ominous mutterings against this bill in Republican states in the West To silence these protests was one reason for passing the Sherman Anti Trust Law (1890) which forbade the trusts to carry on interstate commerce if they were proved to be conspiracies in restraint of trade This act was never completely effective nor was it popular with the business interests which controlled the party that passed it but it was a matter of political necessity

Another act of similar necessity was the Sherman Silver Purchase Act (1890) occasioned by the farmer demand for relief from low prices and high money During the decade following the Bland Allison Act (1878) the general prosperity was so widespread that Greenbackers and free-silver advocates had been reduced in numbers But during the late 80 s crops were poor in the Far West and South and by 1890 farmers were again demanding cheap money (*see* Money) Their leaders persuaded them that a conspiracy of bankers and eastern Republicans existed to monopolize gold and raise its price and that this monopoly caused the high value of the dollar and the low prices of commodities a combination that made

THE THIRD AVENUE ELEVATED STATION AT 67TH STREET IN 1890



The development of rapid transit in large cities during the 1890 s built up huge fortunes for the men who obtained franchises to build street and elevated railways. He e is a view of the New York Elevated in 1890 before electricity had taken the place of steam.

it hard to pay debts. They claimed that the "crime of 1873" which dropped the silver dollar from the free-coinage list was part of the plot. They now demanded relief. The Sherman Silver Purchase Act (1890) required the Treasury to buy each month 4,500,000 ounces of silver bullion, and issue in payment therefor Treasury notes, which were themselves redeemable either in gold or silver at the option of the government. Harrison signed the law unwillingly. It failed to accomplish the desired purpose, for the price of silver bullion continued on its downward path.

JAMES G. BLAINE



Harrison's secretary of state, a vigorous fighter for American rights.

In November 1890, by a huge landslide, the Democrats gained control of the 52d Congress, that was to sit from 1891 to 1893. Of deep influence in weakening the Treasury was a new pension law for Civil War veterans, that no longer required the pensioner to show disability suffered in the service. Need for help was enough, and the pension list rose to more than 1,000,000 names.

Harrison's strange gift for unpopularity weakened his administration by lessening the loyalty of Republican politicians to him. Approaching hard times and discontent in the West made his last two years in office unproductive.

Foreign Affairs

Blaine, in charge of the State Department, carried on a vigorous and distinguished administration. In his earlier term under Garfield, he had sought the coöperation of all of the American republics for their common advantage, and had issued invitations for a conference to be held in Washington. President Arthur had recalled these invitations, but they were now re-issued, and Blaine presided over the first Pan-American Conference in 1889–90. The Pan-American Union was a result of this, and a beautiful building in Washington, the gift of Andrew Carnegie, was later made its home.

JOHN SHERMAN



Author of Anti-Trust Law which hurt Harrison with business interests.

There were other exciting diplomatic episodes that in three cases brought the United States near the verge of war. One was with Germany, one with Chile, and one with Italy. The first concerned the status of the Samoan Islands in the Pacific, in which the United States, Great Britain, and Germany had commercial interests. For 30 years the islands had been disturbed by the struggles of native chiefs for the throne. In 1888 Mataafa, with British support, was elected king in opposition to Tamasese, who was supported by German interests. The three countries involved sent their warships to the islands, and only a hurricane, which sank three American and two German warships with great loss of life, prevented hostilities. Instead of fighting, the American seamen struggled to rescue the shipwrecked Germans and the matter was patched up. The three powers from 1890 to 1900 jointly controlled the islands under a protectorate.

The trouble with Chile was due to an attack upon seamen from the U. S. S. *Baltimore* in the streets of Valparaiso in 1891. Both sides were to blame, but the United States demanded and received apologies under threat of war. With Italy the matter worked the other way. A mob in New Orleans in 1891 lynched several Italian subjects. The city had been intimidated by members of an Italian secret society, the Mafia, but the local jury had failed to convict them. Italy demanded at once that the United States punish the leaders of the mob, and withdrew the Italian minister from Washington in protest. Secretary Blaine had the difficult task of explaining that under the American system the prosecution of criminals was a matter within the control of the state in which the crime occurred; that the United States government could not punish for such crimes; and that it could not even guarantee that the state would be vigorous in its prosecution of them. In the end the United States paid $25,000 to each of the families of the lynched Italians.

The aggressive national policy which Blaine pursued led him to try to protect the seals of Bering Sea from extermination at the hands of the seal hunters. Sealskin coats were fashionable, and the hunters received high prices for the pelts. Blaine declared that the Bering Sea, nearly closed by Alaska and the islands belonging to the United States, was *mare clausum* (closed sea) to other powers. The United States had always denied the claim of any other country to own the ocean, and Great Britain now denied this claim of the United States. The matter was submitted to a special court of arbitration (1893); the court decided that legally the sea was open, and the United States could control only the "territorial waters," three miles off shore; but as a matter of equity the court restricted seal fishing (*see* Seal).

The general business of the State Department in these years had much to do with the rights of aliens who, having been naturalized in the United States,

returned to their old homes and found that their mother countries would not always treat them as citizens of the United States This problem was especially vexatious in the relations with Germany, France, and Italy, from which many men came to the United States in order to escape the military service which those nations required of all their citizens In Hayes' and Garfield's administrations many Irish had acquired American citizenship, and had then returned to Ireland to oppose English rule There were, also, matters connected with the growing export trade of the United States, and the desire of European countries to exclude food from America Meats were often excluded Buffalo Bill, on tour with his Wild West Show, once found that he could not get his buffaloes into Germany because of a law forbidding the entry of 'live cattle"

In 1892, Blaine suddenly resigned as secretary of state, three days before the Republican presidential convention His candidacy for the nomination was not pushed, however, and Harrison was renominated, only to be defeated by Grover Cleveland In the last months of the administration there were fears that before Harrison left office a financial panic would break over the country The Sherman Silver Purchase Law was flooding the Treasury with cheap silver, and confidence in the maintenance of the gold standard of money was lessening The heavy investments and waste of the last decade had used up much of the free capital of the United States The new railroads had brought into the markets so much wheat and cotton that it no longer paid to raise either Farmers were even more discontented than they had been in 1890, and a new farmer party, the Populists, made its appearance with a candidate of its own, Gen James B Weaver The panic was luckily for Harrison, deferred until 1893

At the end of his term Harrison returned to Indianapolis where he resumed the practise of law and steadily enhanced his fame as a lawyer In 1898 he represented Venezuela in the arbitration of a boundary dispute with Great Britain He was a delegate of the United States at the Hague Peace Conference in 1899 Two years later, March 13, 1901, he died He wrote many articles for magazines, and published (1897) This Country of Ours', an account of the operation of the United States government, 'Views of an Ex President' was published after his death

The INDIAN FIGHTER *Who Became* PRESIDENT

HARRISON, WILLIAM HENRY (1773–1841) If the frontier creates the characteristics which are peculiarly American, as has often been asserted, then William Henry Harrison was a typical American, for most of his public career was spent in the frontier wilderness of the Northwest Territory, or representing that region in Washington But by birth and education General Harrison belonged to the aristocracy of Virginia His father was a plantation owner in the tidewater region, who had taken a prominent part in Virginian politics during the Revolutionary War, and had signed the Declaration of Independence After placing his signature to that immortal document, it is said that he remarked to Benjamin Franklin, "Now we must all hang together." 'Certainly," replied Franklin with a smile "We must all hang together, or assuredly we shall all hang separately"



WILLIAM H. HARRISON

As William Henry was the third son of the Harrison family, and the father's property would under the Virginia law of that time go chiefly to the eldest son, a profession was necessary for him His father sent him to Hampden-Sidney College, Va., 1787 to 1790, and then to Philadelphia to study medicine But the young man disliked this calling, and at the death of his father, in 1791, he dropped it President Washington then appointed him an ensign in the army

Harrison's first active duty was under Gen Anthony Wayne, in the campaign in the Ohio country against the Indians He served with distinction in the battle of Fallen Timbers in 1794, and then was commander of Fort Washington, at Cincinnati, until 1798

While garrisoned at Fort Washington, he married Anna Symmes, whose father, Judge Cleves Symmes, was engaged in bringing colonists to his vast Miami Purchase between the Miami and Little Miami rivers

Made Governor of Indiana Territory

In 1798 Captain Harrison (as he had then become) resigned his commission and settled on a tract of land at North Bend, about 16 miles from Cincinnati That same year President Adams appointed him secretary of the Northwest Territory under Gen. Arthur St Clair as governor This was the beginning of his long official connection with the Territory He served as its first delegate to Congress Then when it was divided into the two territories of Ohio and Indiana in 1800, he was appointed governor of Indiana Territory, and acted also as superintendent of

Indian affairs. He was the first territorial delegate from any territory in the United States Congress. As such he rendered an important service to the people in obtaining a change in the land policy of the government, so that the public land was no longer sold in vast tracts to the wealthy, but in tracts small enough for the poorer settlers to purchase.

How He Won the Title of "Old Tippecanoe"

As superintendent of Indian affairs he made in all 13 treaties with the Indians, securing the cession of large sections of land in the Northwest. Tecumseh, a chieftain of the Shawnee Indians, and his brother the "Prophet" objected to this giving up of the Indian lands, and claimed that the consent of all the tribes was necessary before the cession could be valid. The chiefs, they said, had "no right to barter away the land for a pewter ring or a keg of liquor." The result was a formidable Indian War, in which Governor Harrison defeated the Indians at Tippecanoe, near Lafayette, Ind. (Nov. 6-7, 1811). This victory made Harrison a national hero, and he was admiringly called "Old Tippecanoe." (*See* Tecumseh.)

In the War of 1812, Harrison with the rank of major-general was in supreme command of the forces in the Northwest. He urged the construction of a fleet on the Great Lakes, and, after the victory of Commodore Perry on Lake Erie, Harrison crossed into Canada. In the Battle of the Thames (Oct. 5, 1813) he defeated the British and put an end to the war in Upper Canada.

Because of difficulties with the secretary of war, General Harrison resigned his commission in 1814. In the following years his admiring fellow-citizens sent him to the United States Congress and to the Ohio State Senate, and in 1828 he was appointed minister to Colombia. But within a year he was recalled from the latter position and retired to his farm near North Bend.

His Nomination for the Presidency

In 1836 General Harrison was nominated by the Whigs for the presidency, and though defeated by Van Buren, he succeeded in carrying seven states. In 1840 Harrison was again the Whig candidate against Van Buren, who was seeking reëlection. The campaign of that year marked a new era in American politics. With it began the monster meetings, the carnival pomp, and the doggerel verse which for years after marked presidential elections. One part of Harrison's residence at North Bend was a log cabin covered with clapboards; and at the opening of the campaign one of his admirers said that his table, instead of being served with expensive wines, was supplied with cider. So "log-cabins and hard cider" immediately appeared at all the Harrison meetings. The cry "Tippecanoe and Tyler too" carried the Whigs to overwhelming victory, making Harrison president and Tyler, vice-president. (*See* Tyler, John.)

But the strain of the campaign, and of dealing with the multitude of office-seekers in the months that followed proved too much for General Harrison's strength. Although in apparent good health at the time of his inauguration, he soon fell ill of pneumonia and died on April 4, 1841—just one month after he took office. He was the ninth to hold the presidential office, and the first to die during his official term.

It is useless to speculate as to what sort of a president he would have made. On the one side are those who hold that "he was not a great man, though he lived in a great time, and he had been a leader in great things." On the other hand, it is pointed out that he was one of the best territorial governors ever appointed in the United States; and that there is no reason for thinking he would not have shown on the national stage the same qualities of broad-mindedness, integrity, tact, courage, and resourcefulness that he had displayed in the lesser drama of the frontier.

HARTE, FRANCIS BRETT (1836-1902). When Francis Brett Harte, best known as Bret Harte, put the spirit of the lawless, burly life of early California mining camps into stories, he started the American story of local color and atmosphere, which sprang into instant popularity. Though born in Albany, N. Y., he knew the life he wrote about; he had lived in California from the time he was 18, teaching, mining, and setting type. While he was at work in a San Francisco newspaper office he wrote the first of his sketches and was at once promoted to the editorial staff. He became editor of *The Overland Monthly*, in 1868, and contributed to it 'The Luck of Roaring Camp' and 'The Outcasts of Poker Flat', the most famous of his stories of rough western life. Harte had a talent, too, for humorous verse, and the nation laughed at his 'Heathen Chinee', the Chinaman with the "smile that was childlike and bland," who turned the tables on two white men who tried to cheat him at cards:

> Which is why I remark,
> And my language is plain,

says Truthful James, who tells the story—

> That for ways that are dark
> And for tricks that are vain,
> The Heathen Chinee is peculiar.

Bret Harte's fame had spread so far, meanwhile, that the *Atlantic Monthly* asked him to write for it alone. He went east in 1871, lectured awhile on California life, then was sent as consul to Crefeld in Germany, and later to Glasgow, Scotland. His last years, after 1885, were spent in England, where he died. He was the author of many other short stories and one long novel, but his first stories remained the best. He wrote some serious poems, too, of which certain ones deserve a wider reading than they receive.

Bret Harte's chief works are: Stories: 'The Luck of Roaring Camp' (1868); 'The Outcasts of Poker Flat' (1869); 'The Twins of Table Mountain' (1879); 'In the Carquinez Woods' (1883); 'A Phyllis of the Sierras' (1888). Novel: 'Gabriel Conroy' (1876). Poems: 'The Heathen Chinee' (1870); 'East and West Poems' (1871); 'Echoes of the Foothills' (1874).

HARTFORD CONN Business foresight and an advantageous situation have combined to make Hartford one of the chief cities of New England Time and again new kinds of businesses have been developed to meet changing economic conditions The capital and largest city of Connecticut it is now known as the Insurance City More than 45 insurance firms have headquarters here and the towering offices of the largest companies dominate the sky line

Standing at the head of navigation on the Connecticut River Hartford was important in colonial days as the trade center of the fertile valley With the growth of ocean commerce it became a shipping port and its bankers wrote marine insurance When shipping was crippled by the War of 1812 new companies were formed to write other types of insurance

Hartford was also quick to take up manufacturing and produced goods for the famed Yankee peddlers When the nation turned to large scale manufacturing Hartford s skilled artisans made it a center for making tools and machinery Today with its suburbs East Hartford and West Hartford it also makes airplanes airplane parts firearms brushes electrical equipment typewriters and other products It is a trade center and a market for Connecticut tobacco

The city is a symbol of democracy Four years after its founding delegates from the river towns met here in 1639 and adopted the Fundamental Orders This document declared that the foundation of authority is in the free consent of the people and has been called the first constitution in America In 1662 independence was granted to the colony and when Governor Andros demanded that the charter be given up in 1687 the document was hidden in an oak tree The Charter Oak memorial in downtown Hartford marks the historic spot

Hartford became the capital of the Connecticut Colony in 1665 It was the joint capital with New Haven beginning in 1701 The legislature met alternately in the two towns until 1875 when Hartford became the sole state capital

A distinguished show place is the Old State House built in 1796 On Capitol Hill are several impressive state buildings Other notable buildings are Wadsworth Atheneum Avery Museum Trinity College and Hartford Seminary Foundation The Colt Memorial Museum honors the firearms pioneers and the Morgan Memorial the J Pierpont Morgan family Other famous residents of the past include Noah Webster and Mark Twain Hartford adopted city manager government in 1948 Population (1950 census) 177 397

HARVEY WILLIAM (1578–1657) The man who discovered how the blood circulates was William Harvey an English physician Before Harvey's time doctors actually knew little of physiology the science that deals with the functions of the body Harvey s discovery was the most important in the whole history of this science His careful research laid the foundation for our present-day knowledge of the subject

William Harvey was born April 1 1578 in Folkestone Kent England He was the second of eight

HARVEY INSTRUCTS HIS KING



Harvey (standing) shows King Charles I a detail from an experimental dissection of a deer Charles was keenly interested in Harvey s researches and did much to encourage him.

children At ten he was sent to the King s School in Canterbury at 16 he entered Cambridge University where he spent four years When he reached young manhood he was short dark and quick tempered

After he was graduated from Cambridge Harvey became a student at the medical school in Padua Italy the finest such school of its time One of his teachers was Heronymus Fabricius noted surgeon and anatomist Fabricius had already discovered the one way valves in the veins but he was not sure of their purpose Harvey was later to show that they prevent blood from flowing backward Harvey was a good student and a popular one At his graduation in 1602 the school placed a tablet on a building wall in his honor The tablet is still there

Although Harvey had an M D degree from Padua he wanted one from an English school as well A few months at Cambridge were sufficient to qualify him for this second degree He started a medical practice in London and in 1604 he married Elizabeth Browne daughter of a former physician to Queen Elizabeth I Harvey rose rapidly in his profession At the same time he quietly continued his research in the problems of the heart and the circulatory system

In 1616 Harvey was asked to give three lectures to the College of Physicians (a group corresponding to a modern medical society) At this time doctors generally believed that the blood ebbed and flowed in the arteries and veins they did not suspect that it circulated in a continuous route Harvey gave a nearly complete and very accurate account of the circulatory system (*see* Heart and Circulation) Because microscopes had not yet been invented he had no way of seeing the tiny capillaries and the part they play in transferring blood from the arteries to the veins However he realized that some such means must exist for the transfer His work received wide acceptance when his lectures were published in 1628 under a Latin title translated as On the Motion of the Heart and Blood in Animals

In 1618 Harvey was appointed physician extraordinary (ranking below the physician in ordinary, or regular physician) to King James I. When King Charles I succeeded his father, Harvey became his physician in ordinary. Charles took a personal interest in Harvey's researches in circulation and in growth, and he provided the physician with animals for experimentation. Harvey went into retirement when Oliver Cromwell became master of England. He died June 3, 1657.

HARZ (*härts*) MOUNTAINS. Many quaint old towns and ruins of medieval castles still stand in the beautiful Harz Mountains in central Germany. The mountain group rises abruptly between the Elbe and Weser rivers and runs northwest for about 60 miles. Nowhere is it more than 20 miles wide. The granite crests are barren, but the lower slopes are green with pine, fir, and beech. In both summer and winter the Harz is a popular tourist resort.

The highest peak is the Brocken, a mammoth dome-shaped mass of granite 3,747 feet high. Since pagan times a spring festival, called Walpurgis Night, has been held on this peak. According to German legend, witches riding broomsticks gather here on the night of April 30 and dance until dawn around a bonfire lit before the Teufelskanzel (Devil's Pulpit). Walpurgis Night is described in Goethe's poem 'Faust'.

Harz mines have been worked since the Middle Ages. Some copper ore and other minerals are still extracted. Other industries are stock raising and manufactures based on the forests—chiefly paper, matches, and furniture. Many people breed the famed Harz Mountain canaries and teach them to sing.

HASTINGS, WARREN (1732–1818). After Robert Clive had laid the foundations of British power in India, Warren Hastings became India's first governor general. It was mainly owing to Hastings' rare administrative skill that Britain was able to retain India.

Born in 1732, Hastings was early left an orphan in the care of an uncle. After attending Westminster School in London, he was given a clerkship with the East India Company and arrived in Calcutta at the age of 18. Clive recognized the young man's abilities, and before he left India he made Hastings agent for the East India Company in the court of an Indian prince, the Nawab of Bengal. Later Hastings served the Company in Madras. In 1772 the Company recalled him to Calcutta as governor of Bengal. Hastings found the administration in confusion and the Company in debt. At once he began a series of reforms.

The East India Company was originally a mere trading corporation that governed only its own trading posts. Clive had extended the rule of the Company from Calcutta over all Bengal, a vast continental area (*see* Clive). The British government saw the necessity of exercising stricter supervision over a corporation that was collecting taxes, maintaining armies, and exacting large sums of money from Indian princes as payment for giving them protection. In 1773 Parliament appointed Hastings governor general of all the Company's possessions in India.

During the American Revolution, France went to war with England in support of the American Colonies. The war spread to India, from which the French had been trying to expel the British. French officials plotted with Indian rulers and French officers drilled Indian troops. Hastings struck in all directions and struck hard. One army was despatched across the peninsula to Madras, where Hyder Ali, the Mohammedan sultan of Mysore, was laying waste the land. India was saved for the British; but the wars cost money. To pay for them, Hastings exacted increased tribute from the Rajah of Benares and the Nawab of Oudh and also forced the Nawab's mother, the Begum of Oudh, to surrender some of her enormous treasure.

Hastings had to struggle to uphold his authority against a faction in his own governing council. This faction was led by his personal enemy, Sir Philip Francis, whom Hastings had seriously wounded in a duel. When Hastings returned to England, in 1785, Francis, then a member of Parliament, denounced him for corruption and cruelty. The orator Edmund Burke and the playwright Richard Sheridan took the lead in demanding Hastings' impeachment. The trial opened in the House of Lords in 1788 and dragged on for seven years. Hastings was finally acquitted, but the expense of the trial had used up his savings, and the East India Company had to come to his aid. He died in 1818, mourned by many Indian and English admirers. While his methods were sometimes high-handed, he had put the administration of India on a more honest basis than it had ever been.

HASTINGS, BATTLE OF (1066). The Norman Conquest, which brought tremendous changes to England, began with the decisive battle of Hastings, Oct. 14, 1066. Harold II, last of the Saxon kings of England, was killed in this battle. On Christmas Day, William, duke of Normandy, was crowned king. He is known in history as William the Conqueror.

After long preparations, William set sail from Normandy. On September 28 he landed his army at Pevensey Bay, on the English Channel. Harold hastened down from the north of England with his army. On October 13 he took up a strong position on a hill between the port of Hastings and the present-day village of Battle. At dawn the next day William roused his troops and set out on an eight-mile march to join battle before Harold's troops were rested. At nine o'clock the two armies clashed.

All day the battle raged. Norman horsemen pressed up the hill. The English fought on foot. Standing close together, protected by great shields, they wielded their long-handled battle-axes with terrible effect. Toward evening the English ranks broke. Then Norman archers, in the rear, shooting high, showered them with arrows. Harold was mortally wounded by an arrow that pierced his eye. His two brothers were already slain. The rest of the English army fled. (*See* English History; William I; Harold II.)

Hastings, which gave its name to the battle, is now a thriving Sussex town and seaside resort. Population (1951 census, preliminary), 65,506.

The Story of HATS *and* HOW THEY ARE MADE

What Endless Variety in the Headgear of Different Peoples!—The History and Geography of Hats—A Visit to a Felt Hat Factory—Why Panamas Cost So Much—Why Men Lift Their Hats to Women

HATS AND CAPS If we could assemble specimens of the headgear of every land and age on one gigantic hat rack, what an amusing and interesting sight it would make! The fur hood of the Eskimo would stand beside the Mexican's high peaked hat and between the glossy silk hat of civilization and the huge umbrella like straw hat of the Burmese would glow the turban of the Mohammedan and the bright bonnet of the Scotch Highlander The cone-shaped hats of the early Aegean civilization—4 000 years ago—and the tall cylindrical headgear of the Hittite kings and queens would present a fascinating contrast to the cocked hat of Washington's time and the cowboy hat of the western plains The stiffly wired cap of the Norwegian bride would be there, and the round beaver fur hat, lined with red satin and adorned with a diamond clasp, that Charles VII of France wore when he made his triumphal entry into the city of Rouen in 1449.

Why such a marvelous variety of forms? Partly to serve particular needs, partly just for ornament In regions of great heat or intense cold protection is the first purpose of head covering but in the civilized countries of the temperate zone where it is rarely excessively hot, cold, or wet hats vary greatly in shape size, and material Bright colors are common, hats are designed, to a great extent, for decoration, and fashion determines the materials These materials are gathered from all over the world — straw from the Philippines, Italy, and Japan rabbit fur for felt from Australia and central Europe, silk from China, Italy, and Japan, fancy furs and feathers from a score of lands In countries not so advanced where there is little foreign commerce, the materials used for clothing must be those close at hand, and a headdress once adopted is used for centuries

In the western world men's hats change from season to season in minor details of shape and trimming but the principal types have remained unchanged for many years—the straw hat, the silk hat and the felt hat, the last including the soft hat and the stiff hat or derby Besides these there are the popular cloth hats, made of woolen or cotton fabrics, stiffened by many rows of stitching and sometimes by shellac Caps also are largely worn for informal wear

How Felt Hats are Made

If ever you get the chance, visit one of our great felt-hat factories and see how your derby or soft hat has grown out of a few scraps of fur from an *animal* that once scampered over the plains of Australia, Argentina or Canada For the finer grades fur alone is used, but cheaper hats are made from a *mixture of* wool and fur or wool alone The first step is to clean and brush the fur while it is still on the skin and "carrot it by brushing on nitrate of mercury to make it felt more easily Then a machine shears off the fur which passes on an endless belt to blowing machines In these the soft fluff is torn apart by steel teeth and freed from hairs or foreign material

Now begins the transformation into a hat The exact amount of fur needed to make one hat is passed to a boxed in machine, which contains a minutely perforated copper cone about three feet high As this cone revolves myriads of the mistlike fur particles are drawn by suction to its damp outer side, forming a thin covering of felt A wet cloth is thrown over this matted fur, another cone is pressed over it, and the whole is immersed in a tank of hot water until it felts under the pressure The delicate cone of felted cloth is then shrunk to the proper size, dyed, and given a bath of shellac to stiffen it—weak shellac for soft hats, and a denser solution for stiff hats The cone is now plunged in boiling water and flattened at the crown so that it begins to take on the appearance of a hat It is stretched, blocked, and pulled with the aid of hot water, steam and ingenious machinery until it has taken the desired form Stiff hats are put in a hydraulic press to increase their rigidity, and the brim is curled by being pressed on a flange by a bag of hot sand The rough surface is smoothed by rubbing with emery paper, the trimming is put on, and last of all the leather sweat-band attached—and the hat is ready

Straw and Panama Hats

Straw hats are made from high grade imported straw The braids, except for some expensive hats, are sewed and pressed into shape by machinery, after being sized with waterproof gum Panama hats are made from a fine, light "straw" obtained from the leaves of a shrub (*jipijapa*, or *toquilla*) that grows chiefly in Ecuador, though it is also found in Colombia and the forests of the upper Amazon The best hats take five or six months to complete, since the fibers must be kept thoroughly moistened and the weaving is done only in the late twilight or early dawn

In the manufacture of silk hats several layers of cotton material are cemented together with shellac This "body is pressed into shape on a block, and the *rim* is cemented to it Then it is coated with shellac, covered with silk plush, trimmed, and finished

Hat manufacturing is an important industry Connecticut is the leading state in the manufacture of *men's* felt hats Norwalk and Danbury are its largest centers Missouri leads all states in making men's straw hats Men's cloth caps are made in New York City which is also the largest women's millinery center

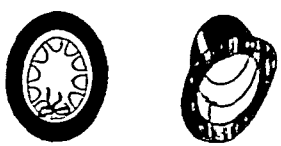
Women's hats are made in factories, wholesale workrooms, and—the more expensive ones—in small shops which sell direct to the customer. These factories and shops buy "hat bodies," usually made of felt or straw, which have already been cut on a hat form, and these are shaped, blocked, and trimmed. Styles in women's hats are ever changing, chiefly under the influence of Parisian designers.

Some Curious Facts about Hats

Did you ever notice the tiny bow that decorates the lining or inner band of most hats, both men's and women's? Not so very long ago, hats were made in only a few sizes, and a drawstring was inserted in the lining, which was tightened or loosened to fit the head. The little bow is a relic of that old practice, although it also serves the purpose of marking the back of the hat. Nearly all these bows are made in Geneva, Switzerland.

The ancient Greeks, when traveling, protected their heads with a flat, broad-brimmed hat of felt which tied under the chin and hung down the back when not needed, like a sunbonnet of today. These tie strings are still preserved in the streamers around the crown of a child's sailor hat.

STORY OF THE LITTLE BOW



The little bows inside men's hat bands are relics of the drawstring used in olden days to make hats fit.

During the 14th and 15th centuries, women's hats, caps, and hoods were of the most extravagant shapes and sizes. Some were horned, others were great peaks, like the "dunce-cap," from a foot to three feet in height. Sometimes a veil would be draped over these towering structures, falling the length of the dress.

Hats have often had an important place in distinguishing sects and parties. The Puritan wore his severe high-crowned hat over his cropped head as a rebuke to the cavalier of the time, with his hair in curls, and a great sweeping plume on his low-crowned hat. The Quaker affected a broad-brimmed gray hat (still to be seen in some conservative communities) which he refused to doff to any man—only to his Maker. In the Roman Catholic and Anglican churches hats and other forms of headgear have a conspicuous place in the differences of costumes which distinguish various ranks and orders of the clergy. During the greater part of the 18th century, two rival political parties in Sweden, known as "Hats" and "Caps," were in constant struggle, the "Hats" representing the nobles, and the "Caps" being the party of the common people. These names were slogans in some bitter battles.

THE ANCIENT HAT BAND



The old Egyptians wore a band to keep their hair in place. We have kept the band but put it on the outside of our hats.

In the English House of Commons members may wear their hats while seated, but take them off when they rise to speak. But in one special case—after a debate has been closed and a vote ordered, but before it is actually taken—a member who wishes to raise a point of order must speak seated and with his hat on. The great Gladstone once ran foul of this custom. He had wandered away from his seat bareheaded, and wished to speak on a point of order as a vote was about to be taken. "Hat! hat! hat!" cried the members in riotous glee as he started to speak. A nearby member lent him a hat, but it was several sizes too small for Gladstone's massive head. With this perched ridiculously atop his head, the "Grand Old Man" was allowed to proceed. This incident illustrates only one of many points of etiquette regarding the hat in the House of Commons. The session is dismissed when the Speaker (the presiding officer) rises and puts on his hat.

THE STREAMERS



Streamers on hats are reminders of the tie strings on the ancient Greek traveling hats.

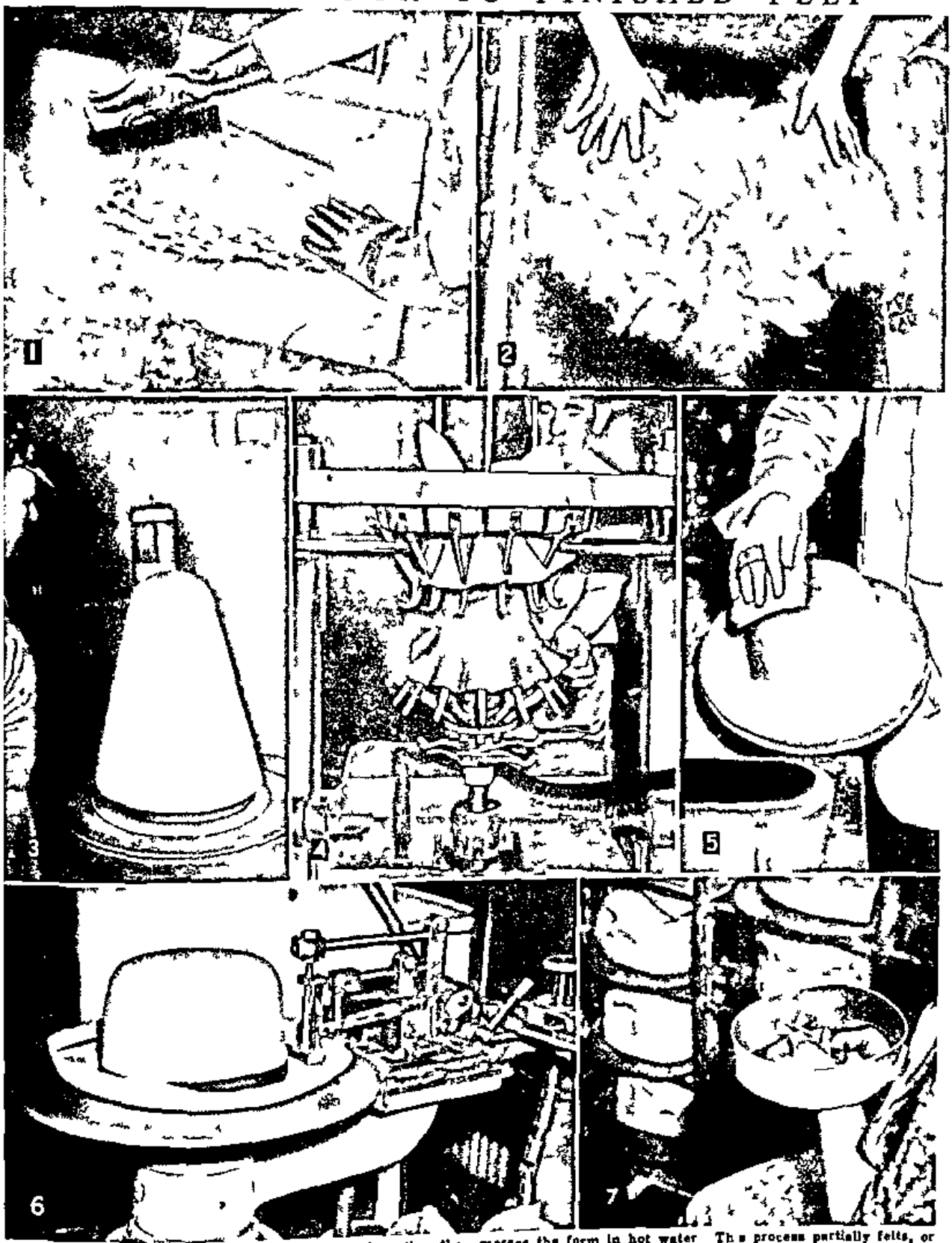
Formerly inferiors were required to uncover in the presence of superiors as a mark of respect. Today this custom survives chiefly in the custom of removing the hat in the presence of royalty and other distinguished persons, and of raising it to ladies while out of doors.

HAVANA, CUBA. A blinding tropical sun beats down upon the narrow white pavements, palm-fringed baseball park, glaring marble palaces, modern office buildings, old gray churches, and gay-colored Spanish houses of Cuba's capital. It blazes upon the concrete docks and forests of masts along its teeming water front, and brightens its background amphitheater of palm-fringed hills.

This is Havana—a city that has truly been called "Spain with a modern American virility, tinged with a generous dash of the tropics." It is, on the one hand, a quaint city of plazas, bazaars, cafés, and lottery, cigar, and wine shops; a city where the boom of ancient cathedral bells mingles with the clang of cart bells and the cries of street vendors as they press their way in and out of old market places piled high with tropical fruit, vegetables, and many-colored fish, and wander down cobbled lanes here and there topped with canvas canopies and edged everywhere by one-story plaster-faced houses with balconies, flat roofs, jutting iron-barred windows, and arched doors leading to dim *patios* or courts.

On the other hand, Havana is curiously modern, with a distinct American flavor. Baseball is now a well-accepted substitute for bull fights and a pretext

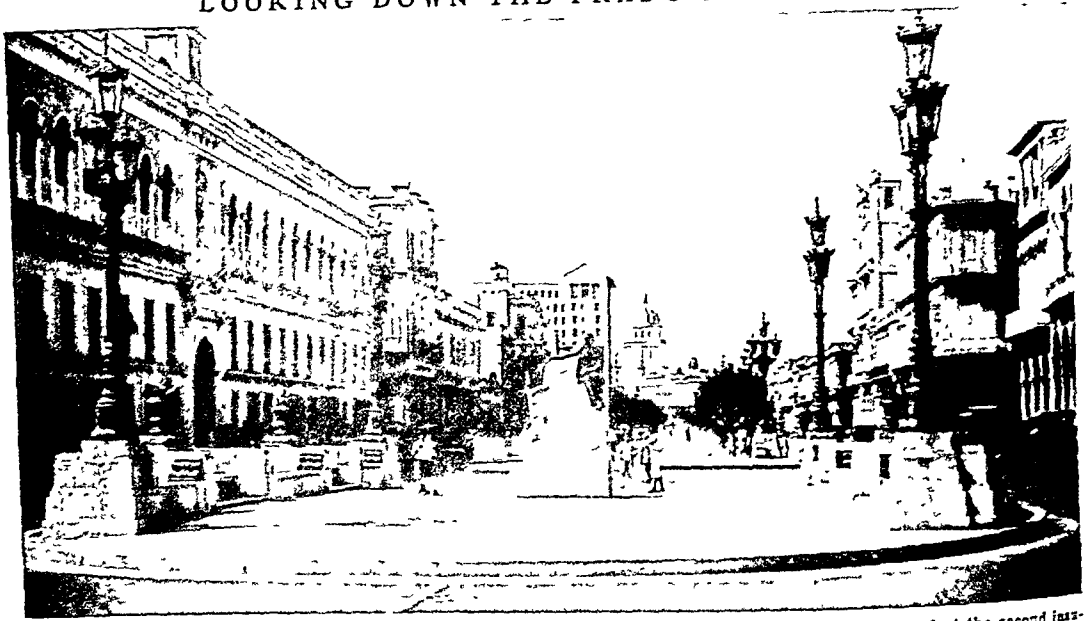
FROM RAW FUR TO FINISHED FELT



The first step in mak ng a felt hat is to clean and strengthen the fur with a chemical applied w th a strong brush (1 This s called carrot ng After the fur is sheared from the h de and *aged in* storage it is fed into a blower (2) which tea s it apart and sepa rates the remain ng d rt and sk n part cles It is then ready for the form ng mill an enclosed mach ne n which the fur is drawn by air suct on over a copper cone (3) The operator then wraps a burlap cloth around the cone drops a tin form *over it, and* im merses the form in hot water Th s process partially felts, or mats the fur After further treatment to harden and shrink it, t *is stretched* over a mach ne (4 which pu is out the edge to form a br m Next the felt is put upon a form block and gallons of cold water run over it Th s completes the felt ng and shaping In the var ous finishing steps the hat is rubbed with sandpaper an operat on ca led pumicing (5) the br m is flanged or curled up and cut to the proper width (6 and the inner band is sewed on (7)

for as much betting; "jitney" automobiles, which are for hire everywhere, compete with clanging street-cars in mad rushes up and down the narrow old streets. The uniform of the khakied Cuban soldier is American and so too are the bill-boards, the electric signs, and the mail boxes. At all points there is thus a curious dovetailing of the old and the new. Office buildings, theaters, hotels, and clubs shoulder crumbled Spanish churches; the latest factory products are found in quaint old-time markets; modern ferries chug across the harbor beside queer old row-boats with awnings at the rear; old convents have been transformed into post-offices and homes of warehouse brokers and customs officers.

LOOKING DOWN THE PRADO IN HAVANA



Cuba is very proud of her beautiful new $15,000,000 capitol building at Havana, which was formally opened at the second inauguration of President Machado. We can see the splendid gold dome of the new capitol in the picture above, as we look down the Prado, finest street in Havana. This street begins at Punto Castle, and follows the line of the old city wall to the Parque de Colon. It is lined with handsome buildings made chiefly from the limestone which underlies the island. The buildings rarely rise above three stories, and their upper stories project over the sidewalk, forming shady galleries.

Havana is the largest and most important commercial city in the West Indies, a city of busy factories, banks, and stores of all description. Its railways shoot out to every important island center. At its doors is one of the safest harbors of the world, where 4,000 ships enter every year flying flags of many nations and laden with cargoes from the United States, Spain, and South America. These same ocean-going vessels then fill their holds with cigars, tobacco, and sugar, three-fourths of which goes to the United States. Havana possesses some of the largest cigar and tobacco factories in the world, although she makes other things, too, such as boxes, barrels, wagons, and carriages.

And last of all there is the Havana that the tourists so admire, the city famous for its promenades edged by mansions of the planter aristocracy, for its public gardens, university, and its drives—such as the beautiful Prado, with its double row of laurels and other shade trees and graceful palms running along a parkway in its middle; a city noted for its old cathedral dating back to 1724, where until 1898 the body of Columbus was thought to have rested; for the picturesque old forts of Morro Castle, La Cabana, and Punto Castle, that guard the entrance to its harbor; for the Governor's fine palace; and for the many seaside resorts near by.

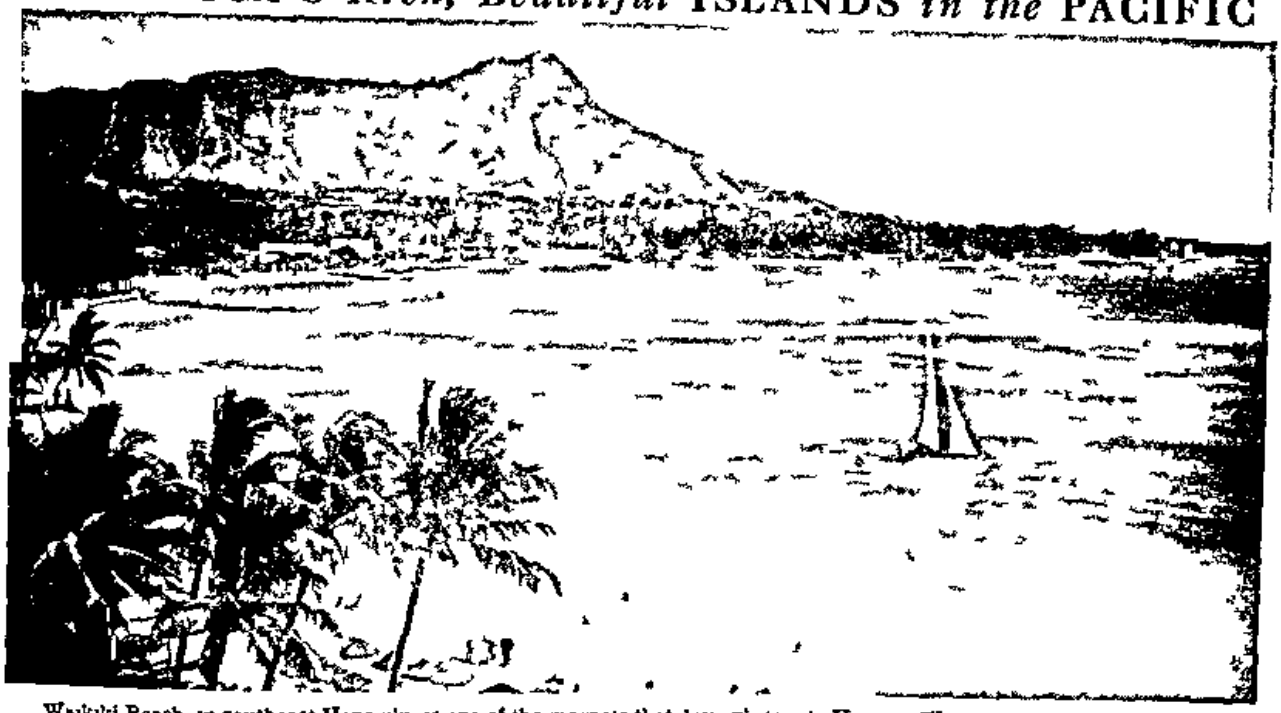
In the older parts, Havana is still rather neglected looking, although it is much cleaner and more sanitary than it was before the United States military occupation in 1898, when the Americans helped to clean it up and eradicate its yellow fever. The newer portions of the city are modern, picturesque, and well laid out.

Havana is situated on the north coast of Cuba on a sort of peninsula between the Gulf of Mexico and the land-locked harbor. It was founded by Velasquez in 1519. It remained the chief city of the Spanish power in the West Indies till near the end of the 19th century. In February 1898 the United States battleship *Maine* was blown up in its harbor, and during the Spanish-American War that followed, the city was blockaded by the United States fleet. With the emancipation of Cuba from Spanish rule, Havana became the capital of the new republic. Population (1953 census), 787,448.

HAVRE (äv'r) FRANCE The second largest port in France Havre is called the seaport of Paris It is 108 miles northwest of the capital at the mouth of the river Seine The French call it *Le Havre* (the harbor) It was only a fishing hamlet until 1516 when Francis I fortified it and began the construction of the harbor

After the first World War a plan for harbor development was undertaken including the building of a gigantic breakwater across the entrance channel to form a new great outer harbor and to serve also as point of arrival and departure for seaplanes Enormous new warehouses were built A large basin was constructed in the outer harbor to take care of the petroleum trade and huge storage tanks were provided These and other improvements made Havre one of the world's largest and finest harbors In the second World War Havre was blasted from air and sea The people lost almost everything After the war the European Recovery Program launched by the United States helped the French to rebuild the city The business section rose in concrete and steel Havre now specializes in making lace and chemicals and building ships Population (1946 census) 105 491

AMERICA'S *Rich, Beautiful* ISLANDS *in the* PACIFIC



Waikiki Beach in southeast Honolulu is one of the magnets that draw visitors to Hawaii. Warm water laps the sun baked sand and a coral reef offshore breaks the Pacific's waves into pleasant rolling surf Beyond rises rugged *Diamond Head*

HAWAIIAN ISLANDS Eight beautiful tropical islands far out in the Pacific Ocean may become the 49th state in the Union The Hawaiian Islands have been a territory of the United States since 1900 Since the second World War the citizens have been making a vigorous campaign in Congress for statehood and self government

In 1947 and again in 1950 the United States House of Representatives passed bills to make the territory a state but these bills did not reach a vote in the Senate In 1950 the people adopted a model constitution for a state of Hawaii in a new move toward statehood

Advocates of statehood say that Hawaii has all the requirements Its population is greater than that of most territories when they became states It is larger in area than three of the states and pays more federal taxes than ten of them To the argument that it is too far from the national capital leaders reply that fast air and sea transportation have brought it *closer to* Washington D C in travel time than California was when it entered the Union

The group of eight principal islands of the volcanic Hawaiian Archipelago lies between 2 100 and 2 500 nautical miles from the west coast of the United States It curves 400 miles southeast to northwest just south of the Tropic of Cancer An additional chain of volcanic islets, rocks reefs and shoals arches 1 000 nautical miles further northwestward

Extent Length of island chain total 1,650 statute miles main group 400 miles Total land area 6 407 square miles Area of principal islands Hawaii 4 021 Maui 728 Oahu 589 Kauai 551 Molokai 259 Lanai 141 Niihau 72 Kahoolawe 45 Distance from San Francisco 2 091 nautical miles from Yokohama 3,398 miles Population (1950 census 499 794.

Natural Features —Islands of volcanic rock rising to mountain peaks from 18 000 feet below the sea and fringed with coral reefs Highest peak Mauna Kea 13 784 feet Mauna Loa world's largest active volcano Kilauea world's largest active crater

Products —Cane sugar canned and fresh pineapple canned juice coffee cut flowers cattle hogs poultry and eggs dairy products fish

Cities —Honolulu (capital) 248 034 Hilo 27 198 Wahiawa Kailua Lanikai Wailuku Waipahu (over 7 000)

Pacific Paradise and Crossroads

Famed for beauty of mountain and shore and for year round summer climate the islands

have been termed the Paradise of the Pacific. So huge is the host of visitors they attract that entertaining them has been called the islands third industry. Growing and processing sugar cane and pineapple are the first and second largest sources of wealth.

The islands are the only considerable mass of land in the middle Pacific north of the equator. They provide a valuable crossroad for air and ocean traffic between American and the leading harbors of Asia and Australia.

Their strategic location was tragically affirmed on Pearl Harbor Day, Dec 7, 1941. On that historic morning the Japanese opened war on the United States. With an air and submarine attack on the Pearl Harbor naval base Japan dealt a crippling blow to the fleet guarding America's coast (*see* World War, Second).

The war proved Hawaii's importance as a defense base. As the United States took the offensive, the islands became the great center through which men and supplies poured out to Pacific battlefronts. Army, air, and naval installations were strengthened and increased. The islands became a gigantic training area. When fighting broke out in Korea in 1950, troops and munitions again passed through the islands; and the wounded were flown there for rest and treatment en route to the United States.

Surface and Climate

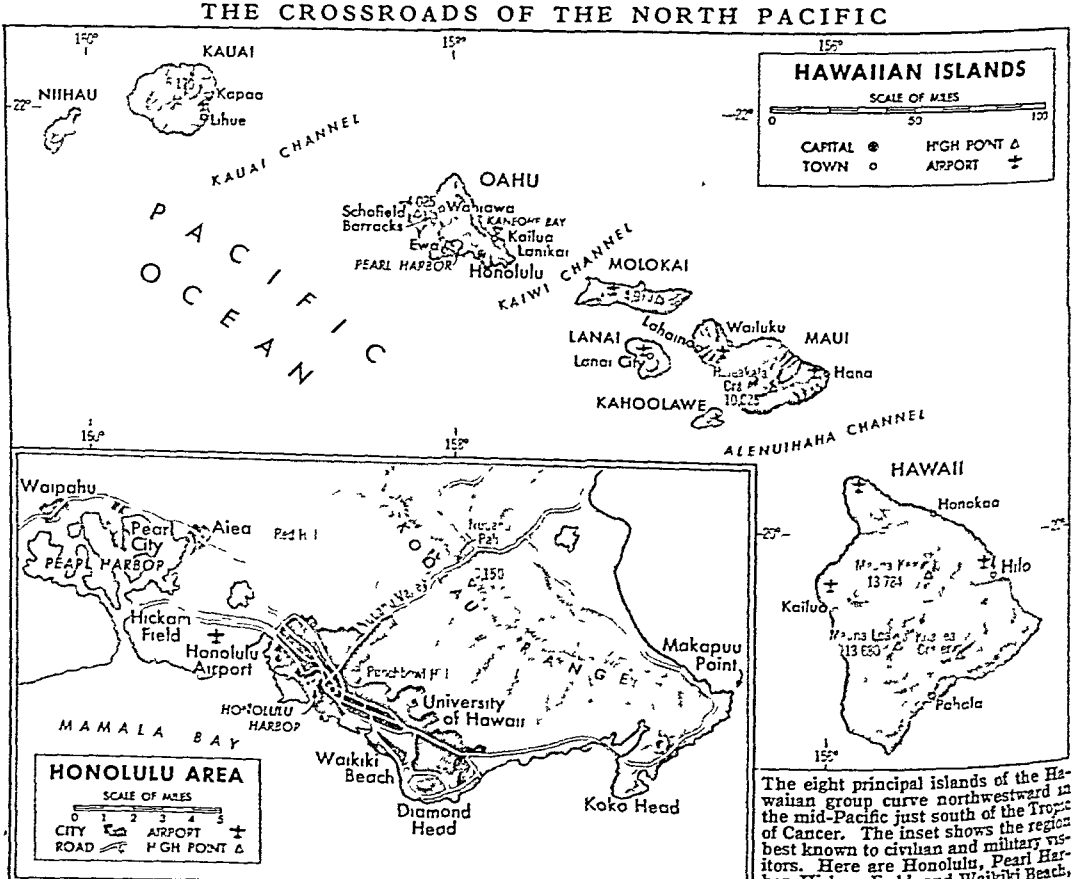
The Hawaiian Islands are the eroded tops of great volcanoes. They were thrust upward through a huge rift in the bottom of the Pacific Ocean perhaps 3 million years ago. The combined area of the eight main islands is less than that of New Jersey.

All the islands are mountainous. In places the land rises from the sea in sheer high cliffs, called *pali*, which may tower hundreds of feet in height. Elsewhere rolling plains slope gently to the beaches. Frozen flows of dead lava contrast with the lush green of tropical vegetation. Deep ravines and canyons have been carved in the earth by the short, plunging rivers. The beaches, generally narrow, may be white with coral sand or black with ground lava.

Most of this rugged land remains tropical wilderness. Less than 10 per cent can be farmed. Another 10 per cent is pasture for cattle, goats, and sheep.

Cooled in summer and warmed in winter by the ocean winds, the islands are seldom too hot for comfort and are never cold. Temperatures are moderated by the cool waters brought from the northeast by the

THE CROSSROADS OF THE NORTH PACIFIC

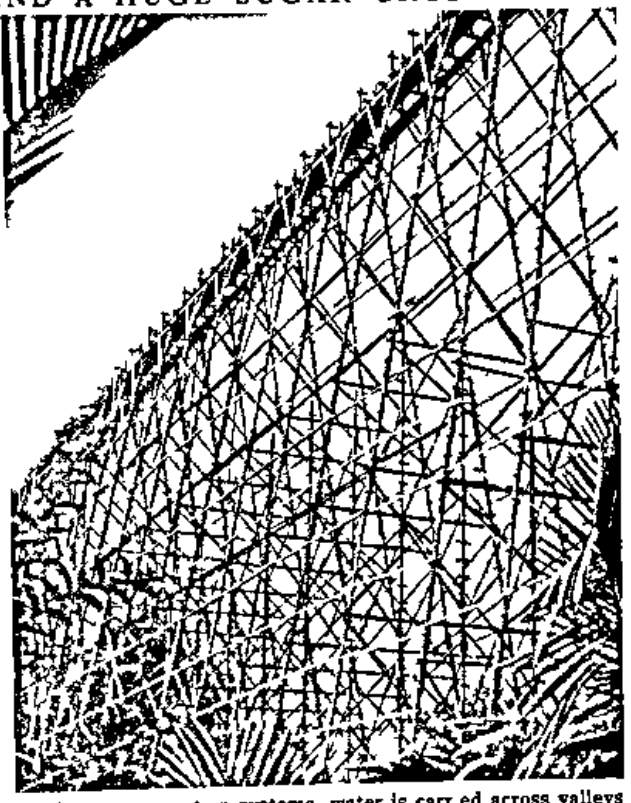


The eight principal islands of the Hawaiian group curve northwestward in the mid-Pacific just south of the Tropic of Cancer. The inset shows the region best known to civilian and military visitors. Here are Honolulu, Pearl Harbor, Hickam Field, and Waikiki Beach, all on Oahu.

FERTILE VOLCANIC SOIL AND A HUGE SUGAR CROP



Here we see the dead crater of Haleakala on Maui one of the volcanoes that built the islands Its rim measures 21 miles The highest of the cones rising from its floor is taller than the Empire State Building



In Hawaiian irrigation systems water is carried across valleys in flumes mounted on high trestles Bundles of cane may be washed from field to mill through these flumes Cane requires 4 000 pounds of water to produce a pound of sugar



Hawaiian sugar planters fire their cane fields to burn away trash and leaves before cutting the juicy stalks They have developed many scientific laborsaving methods for cultivating and harvesting their valuable crop

California current The annual temperature at Honolulu averages 75° F with only about five degrees difference between summer and winter

The trade winds blow toward the northeast slopes of the islands bringing torrents of rain In some places the total fall amounts to 300 or 400 inches a year Mount Waialeale on Kauai is one of the world's wettest spots with rainfall that has amounted to 624 inches in a year Because mountain barriers block the winds the southwest slopes may get as little as 10 or 15 inches annually and irrigation is needed for crops Great water supply systems have been built to carry the excess water from the rainswept slopes through mountain tunnels to dry but fertile fields beyond

The Islets to the Northwest

The islets stretching northwest are tiny They include Kaula Nihoa Necker La Perouse Pinnacle or French Frigate Shoal Gardner Pinnacles Laysan Lisianski Pearl and Hermes Reef Midway Islands and Kure

The islands from Nihoa to Pearl and Hermes Reef were reserved as a refuge for sea birds in 1909 The Territory of Hawaii also administers Palmyra Island 960 miles southwest

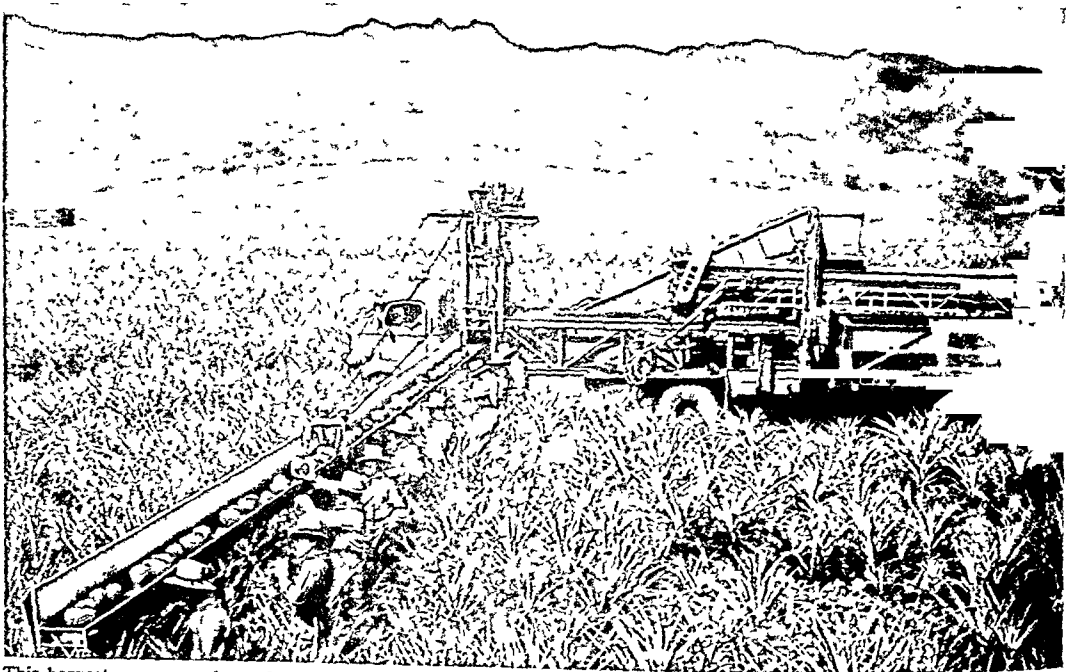
Nature of the Islands—Oahu

Honolulu's good natural harbor helped Oahu become the wealthiest and most populous of the islands One of the world's important ports it is crowded with ocean liners freighters and fishing boats The business section of Honolulu is much the same as any other American city, with wide paved streets large buildings fine hotels clubs schools and churches The residential districts climb the hills and spread beyond famed Waikiki Beach Palms shade the streets The many parks and gardens are bright and fragrant with flowering trees and plants

Near the port and the airport smiling Hawaiian women sell *leis* or garlands made from such tropical and subtropical flowers as hibiscus ginger plumeria ilang ilang ilima gardenias and crown flower Among the street crowds faces of every shade of white yellow and brown show that this is the home of a complex mixture of peoples

Oahu is the site of most of the military and naval installations on the islands Six miles west of Honolulu lies Pearl Harbor in a landlocked basin that could shelter all the ships of the American fleet It is one of the strongest naval bases in the world Here are barracks shops and huge dry docks Scho-

LABORSAVING MACHINERY IN THE PINEAPPLE HARVEST



This harvester-conveyer has a long boom with a moving belt. It travels ahead of the pickers, who select and pluck the mature "pines" and lay them on the belt. Then the belt drops them into a trailer to be hauled away to the cannery. Notice that the pineapple field occupies the highest land which can be readily cultivated. Beyond rise the rugged volcanic hills.

field Barracks, a few miles inland, is one of the largest United States Army posts. Other Army establishments include Fort Shafter, Fort Armstrong, Fort De Russy, Fort Ruger, and Fort Kamehameha. Hickam and Wheeler fields are the chief Air Force bases. Kaneohe air station on the eastern, or windward, side of Oahu is a base for naval and marine aircraft.

Of Oahu's many scenic areas, perhaps the best known is the Nuuanu Pali, a notch, or pass, in the Koolau Range, where the pali, or cliff, falls sheer for hundreds of feet. It affords a breath-taking view of the windward coast and the Pacific. In a burned-out crater, the Punchbowl, a cemetery was opened in 1949 for servicemen killed in the second World War and in Korea.

On Oahu, as on the other islands, most of the arable lowland up to about 2,000 feet is occupied by big sugar plantations. On higher ground the pineapple thrives. Many of the large sugar-cane processing plants and pineapple canneries are on Oahu.

Hawaii, the "Big Island"

Twice as large as all the other islands together, Hawaii was piled up by five volcanoes whose eruptions overlapped one another. Two of these are still active and are continuing the process of island building. Mauna Loa, 13,680 feet, the largest active volcano in the world, has erupted frequently in modern times. Kilauea crater, 4,000 feet up the cone of Mauna Loa, gives visitors an opportunity to look into the heart of an active volcano. A highway from Hilo leads inside the rim of the outer crater. Hardened lava blocks and fissures spouting sulfur fumes line the path to the fiery cauldron of the inner pit. Here a lake of molten lava swells and ebbs. In 1790 a sudden eruption of hot ash destroyed an army marching against King Kamehameha I. Kilauea erupted in 1952 after 18 quiet years. These volcanoes, together with the extinct volcano of Haleakala on Maui, make up the Hawaiian National Park (*see* National Parks).

Mauna Kea (13,784 feet), the highest peak, is quiet and snow covers its summit in winter. It appears higher than a peak of equal altitude in a mountain range, for it towers sharply upward from the sea.

Hilo, the chief city of the "big island," lies on a mountain-girt harbor on the moist, windward northeast coast. Great cattle and sheep ranches in the island's interior raise a good share of the territory's meat. Picturesque cowboys, called *paniolas*, herd the cattle. Where there are no harbors, they drive the animals into the surf to be loaded on boats for shipment to other islands.

The highlands of the dry west, or Kona, coast provide the soil and altitude for growing coffee. Sugar plantations occupy lowlands. Near Hilo, orchids are grown commercially for export by air freight.

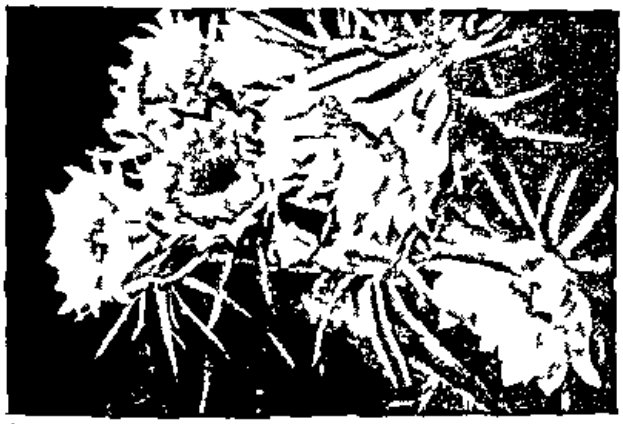
Maui, Kahoolawe, Lanai, and Molokai

Maui, like Oahu, consists of volcanic twins, united at their base. Mount Haleakala, which fills the eastern half, rears its tremendous crater 10,000 feet into the clouds. A trail leads through the crater where the rare silversword plant grows amid dead cinder cones. Lahaina, on the southwest coast, was the ancient capital of the Hawaiian kings. Here be-

RARE AND LOVELY PLANTS



The striking gray silversword plant grows in the lava cinders of dormant Haleakala crater on Maui Island.



On a few moonlit nights the night blooming cereus opens great waxy blossoms a foot long and six to eight inches wide

tween 1820 and 1870 rowdy whaling crews spent the winter while their greasy ships lay anchored in the broad roadstead Today Maui has the largest Amer an sugar plantation and many other sugar and pineapple fields and cattle ranches

Small Kahoolawe Island was once used extensively for cattle-raising but its pasture was cropped away by goats and it is now badly eroded It was used as a bombing range for Navy and Air Force training during the second World War

Lanai is owned by the world s largest pineapple plantation It has its own town harbor and airport On Molokai there are ranches and small farms as well as big plantations Kalaupapa is the site of a famous leper colony where the Belgian priest Father Joseph Damien carried on his heroic work before leprosy killed him Modern treatment has diminished the number of patients here

Kauai and Small Niihau

Lush vegetation on Kauai s wet windward slopes has given it the title Garden Island The tangled ferns vines flowers and trees of a rain forest grow where mountain peaks pinnacles and ravines are too rugged for cultivation Luxuriant fields of pineapple sugar cane and rice spread across the lower lands The Grand Canyon of the Waimea has the rainbow colors and majestic forms seen in the Grand Canyon of the Colorado Remains of masonry walls and water courses on the island are believed to have been the work of the *Menehunes* a Polynesian folk who lived here before the coming of the present Hawaiian stock

A single family of Scottish descent named Robinson owns the small island of Niihau The people here are nearly all of pure Hawaiian stock and speak the language of their forefathers Cattle and sheep raising are the chief means of livelihood

People of Many Races

The inhabitants of Hawaii are of varied races and peoples Like the United States it was settled by immigrants The Hawaiians found here when the islands were discovered in 1778 were a Polynesian people Their ancestors had made the long voyage from Tahiti in outrigger sailing canoes probably between the 11th and 15th centuries They were—and are—a tall strongly built folk with handsome features brown skin wavy black hair and a gentle friendly disposition According to their traditions they had conquered a smaller Polynesian folk the Menehunes who had sailed from the South Pacific several centuries earlier

Today less than 3 per cent of the people are of pure Hawaiian stock and only about 19 per cent are of Hawaiian ancestry The largest of the non Hawaiian groups is the Japanese composing about 40 per cent of the population Next are Caucasians called *haoles* chiefly American and Portuguese making up about 15 per cent Other groups include Filipinos Chinese Puerto Ricans and Koreans

This mixture of peoples developed as great sugar plantations brought in laborers of one nationality and then another to work in the fields Intermarriage between the peoples has increased steadily lowering the proportion of persons of pure racial stock

All Hawaiian citizens are citizens of the United States Children born here are citizens even though their parents may be excluded from citizenship by federal law

How the People Live in Modern Hawaii

Most of the people live in the cities of Honolulu and Hilo in the few towns and in the company villages of the big plantations Their life is very different from the existence on primitive tropical islands After it was found that sugar cane and pineapple could be raised profitably in the soil and climate more and more land was used for these purposes A large share of the people work for the plantations and for sugar mills and pineapple canneries Others are engaged in trading and finance selling the sugar and pineapple products abroad and importing and distributing food clothing and other products needed in Hawaii Thousands are employed in service occupations catering to the needs of the visitors military personnel and permanent residents

The way of life in Hawaii is essentially American Nearly everyone speaks English follows American customs and uses American products Most of the ways of old Hawaii vanished long ago and the Oriental customs of Japanese and Chinese immigrants are fast disappearing as new generations attend the

schools. Enough Hawaiian and Oriental features remain, however, to lend spice and variety to island life. Hawaiian words are heard in everyday speech. In giving directions, a place is said to be *makai*—toward the sea, or *mauka*—toward the mountains. A person in trouble has *pilikia*.

The year-round summer encourages residents and visitors to enjoy life in the open air. Houses have outdoor living rooms, called *lanais*. Everyone throngs the beaches where favorite sports are surfboarding and outrigger-canoeing learned from the early Hawaiians. Boys on sandlot football teams give the game a South Seas flavor by playing barefoot. Other sports range from deep-sea fishing to skiing on Mauna Kea's cone.

Traditional Polynesian and Oriental dishes are popular. Hawaiian feasts, called *luaus*, feature whole roast pig cooked by means of hot rocks in a pit and eaten outdoors. Entertainment may include native dances, especially the graceful *hula*, and the singing of plaintive Hawaiian melodies.

Life and Customs in Old Hawaii

The islands and the surrounding sea provided everything the Hawaiians used before the white man came. Their old-time communities usually covered a strip of land running from the beach up toward the mountain-top. From the sea they took fish. On the wet lowlands they grew taro root for their favorite dish, called *poi*. Here also they built stone fish ponds. They raised unirrigated crops on the higher land. From the forested upper regions they took the timber, leaves, and grasses to construct their houses and canoes and to make spears and clubs for war. From certain kinds of lava rock they fashioned sharp-edged tools. They had no beasts of burden, no wheels, no metals, and no pottery.

They built houses with a sturdy frame of *koa* wood lashed together with sennit fiber, thatched all over with *pili* grass. Mats woven from large *lauhala* leaves from the pandanus tree served as the chief furnishings. Gourds and coconut shells made containers to hold supplies. Skilled woodworkers hollowed out bowls and platters. Small stone lamps burned oil pressed from *kukui* nuts. Strings of these nuts were skewered together to make torches.

The inner bark of the paper mulberry tree yielded the material for *kapa* (or *tapa*) cloth, from which their scanty clothing was fashioned. Strips of the bark were pounded together to make a man's loincloth (called a *malo*), or a woman's skirt (called a *pau*), or for the shawls occasionally worn. The kapa-makers used hardwood beaters carved to print a design in the kapa. Later the design might be stamped or painted with colors made from plant juices or colored earths. Beautiful cloaks for kings and chieftains were made by fastening the colorful feathers of birds in fine-mesh netting.

Foods, Plants, and Animals

The people spent most of their time outdoors. They cooked in a pit dug in the ground. Here they heated rocks red hot. Then they wrapped fish, taro root, sweet potatoes, and other foods in the large, tough leaves of the *ti* plant and placed them in the pit between layers of hot rocks. The food steamed and cooked until the rocks cooled.

When the seafaring Polynesians reached Hawaii they brought with them many useful plants that did not grow there before, such as taro, bananas, sugar cane, yams, sweet potatoes, *ohia ai* (mountain apples) and the breadfruit tree. They may have brought the coconut palm, or coconuts may have drifted to the beaches. (For pictures of plants of the area and methods of preparation, *see* Pacific Ocean.) White settlers later introduced citrus fruits, avocados, pineapples and various other subtropical food plants.

Native animals and land birds were few in these remote islands. The Polynesians imported dogs, hogs and chickens, and the white men brought other domestic animals. Some of the most beautiful native birds disappeared because their feathers were used to make ceremonial capes and helmets for Hawaiian chiefs. These included the *mamo* and the *oo*, each with a few

SPORTS AND CRAFTS OF HAWAII



The exciting sport of surfboard riding was a favorite with kings and commoners in old Hawaii. Modern Hawaiian athletes like this one are equally expert at it. They teach the sport to visitors in the celebrated rollers of Waikiki Beach.



These girls weaving lauhala leaves are carrying on a craft well known to their ancestors. The early Hawaiians made floor mats, baskets, and even canoe sails from the tough pandanus leaves.

VISITORS ENJOY A HULA AND A FEAST OF PIG AND POI





The p etty young hula dancer shown in the picture above wears a ginger flower le and a ti-leaf skirt. At the right Hawaiians preparing a luau or outdoor feast for v s tors remove a roast p g f om a rock heated p t called an imu

lovely yellow feathers and the red *iwi*. Later settlers homes ck for the s nging of familiar b rds have imported many spec es.

Children Learned without Books

Children learned to s vim almost as early as th ey learned to walk and soon be ame expert at vater sports. They rode surfboards on the easy swells ins de coral reefs. They learned to manage the r outrigger canoes in rough water and to fish with nets and spears. They went coast ng too, but not on snow. They sat on a sled of ti leaves and slid down a hill of sl ppery grass. They took part in such familiar pastimes as kite flying, rope skipping, hide and seek and st lt walking.

Young and old enjoyed boxing, wrestling, fencing and foot racing. They had dart-throwing games and a kind of bowling. The r *konane* game was something like checkers.

There was no school. There was not even a written language to read until the missionaries came. Native legends and history were woven into songs and chants which were sung over an l over so all the people could remember them. They also dramatized their legends in dances such as the famous hula.

The Hawa *an language is* w r tten with only 12 letters, the five vowels and the consonants *h k* and *l* (interchangeable with *t* and *r* respect vely) *m n p* and *w* (somet mes pronounced like *v*). Each vowel sound is pronounced separately.

Religion and Government in Old Hawaii

Religion based upon nature worship *played a large* part in the lives of the early Hawaiians. According to their trad tions the god Kane created *the universe* from a gourd or calabash. He formed the earth from the pulp of the gourd, tossed *the shell aloft for* the sky and dotted it with seeds to serve as stars, sun and moon. A second deity, Lono, added trees and flowers, wh le a third god, Ku, created man. Pele, the goddess of fire, stirred the volcanoes to erupt on when she grew huhu (angry).

Kings or ch efs a ded by priests, sorcerers and oth er leaders called *kahunas* ruled the communities. They enforced control over the people through rel g ous restr ctions called *kapus* or tabus. Death was the penalty for such offenses as lett ng one s shadow fall upon a chief, for eating w th a person of the oppos te sex, or for entering a forb dden dwelling.

Commerce and Industry in Modern Hawaii

Sugar products have been the most valuable export of the territory for a century. Canned pineapples and pineapple juice rank second. Associations of plan tat on o vners carry on scientific experiments on both crops. Canes have been developed to y eld a maximum of s weet ju ce and a minimum of wasteful leaves. Pest-control methods have been worked out. Flavorful pineapples have been developed in a shape that will go into a can with little waste. Planta tion workers were unionized after the second World War and probably get the h ghest agricultural wages in the world.

Insulating board made from a sugar-cane by prod uct (bagasse), canned fish, and coffee are among the secondary exports. Orchids and other exot c flowers, leaves, and ferns are shipped by air. Most of Hawai s exports go to the mainland of the United States. In turn nearly all the imports come from the Un ted States. Fresh and canned foods must be brought in because so much of the farmland is planted in the export crops. Coal, petroleum products, and virtually all manufactured articles must be imported.

Ocean shipping is important to this trad ng area. In recent years air travel has exceeded travel by sh p both across the ocean and between the islands. Good highways link the towns with scenic regions and

plantations. Railway mileage is small, as trucks have replaced the plantation railways. Telephone messages between the islands are carried by radio.

Education and Government in the Territory

The territory has a public school system similar to that on the mainland and many private institutions. The schools have surmounted the problem of teaching pupils of many tongues and are largely responsible for Americanizing the population. The first schools were established by missionaries in 1820. Instruction is in English. The University of Hawaii at Honolulu was founded by the legislature in 1907 and is supported by territorial and federal funds. The Library of Hawaii was created by the legislature in 1909. It serves the islands with main and branch libraries and bookmobiles. The Bishop Museum, the Carter Library, and the Honolulu Academy of Arts have fine exhibits and book collections dealing with Hawaii and the Pacific.

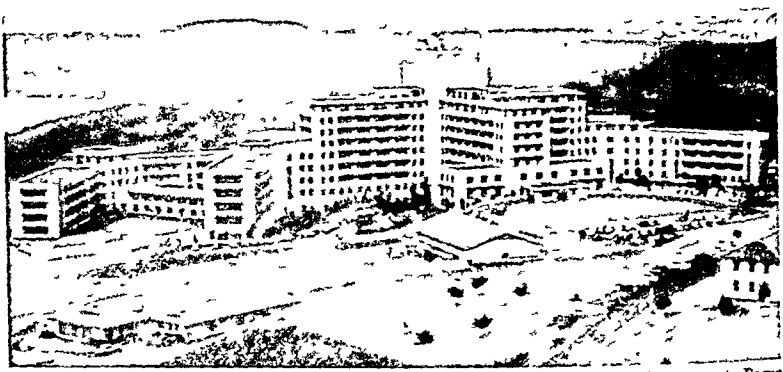
The governor, the territorial secretary, and the judges of the supreme and circuit courts are appointed by the president of the United States. The citizens elect the members of the territorial legislature, local officials, and a delegate who represents the territory in the United States Congress. He has no vote in the Congress.

History of the Islands

Captain James Cook, the famous English explorer, first made the islands known to the world, though they were probably seen by a Spaniard, Juan Gaetano, in 1555. When Cook landed on Kauai, Jan. 20, 1778 the people believed him to be a reincarnation of their god Lono. They sent messengers in swift canoes to announce his arrival, and he was greeted everywhere by worshipful throngs. Cook was killed on the coast of Hawaii a year later when a fight broke out between his crew and a group of Hawaiians who had stolen a boat. He named the islands the Sandwich Islands (*see* Cook).

Trade between the Occident and the Orient increased tremendously in the following century, and Hawaii became a supply point for whalers and trading vessels. Masters of the sailing ships discovered sandalwood here and opened up a trade with China that stripped the islands of these trees.

TRIPLER ARMY HOSPITAL ON OAHU



Thousands of veterans of the fighting in Korea remember this huge military hospital gratefully. En route to mainland hospitals the wounded were flown here for rest and treatment. Begun during the second World War, its 1,500 beds are available to men of all services.

HONOLULU HARBOR, KINGDOM OF HAWAII, IN 1882



When this scene was photographed in 1882, ships in the harbor were chiefly sailing vessels. They carried most of the huge cargo of raw sugar to the United States. Regular steamer service to and from San Francisco had started only recently.

Between 1792 and 1810 King Kamehameha I conquered the various local kings and chiefs and united the islands under a single ruler His descendants reigned over the islands for almost a hundred years

The first missionaries were Congregationalists who came from Boston in 1820 on the ship *Thaddeus* They were followed by others from America and Europe They became advisers to the rulers and were influential in liberalizing the government and in advancing education The descendants of the early missionary families have played an important part in the industrial and commercial development of the islands

The leading commercial nations of the 19th century were rivals for trade and influence in the islands They vied with one another in making favorable treaties with the government and in heaping favors and honors upon the rulers The Americans had been most active in developing the rich sugar industry and gradually they attained the greatest influence in the islands

Annexation to the United States

In 1893, when Queen Liliuokalani attempted to abolish the constitution granted by King Kamehameha III, a revolution took place The queen was deposed, and the new government applied for annexation to the United States When he took office President Grover Cleveland withdrew the annexation treaty from the United States Senate on the ground that the United States minister backed by marines from a naval vessel had improperly aided the revolution Hawaii was then organized as a republic in 1894 with Sanford Ballard Dole as president In 1898 during the administration of President William McKinley a treaty of annexation was concluded

The decades following saw great economic progress and the spread of American institutions and customs throughout the islands Meanwhile the United States built defenses for its distant territory It had obtained the exclusive right to use Pearl Harbor as a naval coaling and repair station in 1887 but building did not begin until 1908 The same year the War Department ordered the construction of Schofield Barracks Expansion of army navy, and air installations was under way on Dec 7 1941, when Japan launched its attack on Pearl Harbor (*see* World War Second)

Fearing an invasion attempt, the Army proclaimed martial law Civil government was not restored until Oct 18 1944 Anxiety arose at the presence of more than 150 000 people of Japanese birth or extraction Suspected leaders were interned *but the vast majority* worked peaceably on the plantations and construction projects and there was no sabotage *Hawaiian*-Japanese troops made a notable combat record in Italy during the war

After the war the people renewed their plea for statehood but the United States Senate postponed action During the fighting in Korea, *the islands* again played an important role as a military crossroads and supply base

HAWK Until recently all hawks had the ill will of every farmer and sportsman because of the havoc which some members of this large group work among poultry and other birds Careful study has shown that all but three species do more good than harm by destroying enormous numbers of small rodents and insects harmful to grain fruit trees and birds The true bird killers and the only ones that deserve the name 'hen hawks' are the sharp-shinned hawk, Cooper's hawk or the blue darter, and the goshawk These are bold marauders and do most of the mischief that is attributed to the hawk group

About 450 distinct species of hawk are recognized but only 34 are found in the United States and Canada All of them hunt by day and possess remarkable keeness of vision great swiftness of flight and immense clutching power They are distinguished from the vultures by the fact that they rarely taste anything they have not themselves killed Most of them are plain colored in browns and grayish whites with darker markings and are unadorned with plumes They do not sing but have a call resembling a harsh

MALE MARSH HAWK STANDING GUARD



The marsh hawks fearlessly place their nest on the ground with little to hide it. The male hawk helps in building the nest and in feeding the young birds Here we see him guarding the nest and its seven eggs The hawks are aggressive and even young ones still in the nest will fight if a man attempts to touch them

scream According to species they nest on the ground or in trees

The sharp-shinned is the smallest of the three pernicious hawks It is a bird about 11 or 12 inches long, bluish gray above, and white, heavily barred with brown beneath Although little larger than a robin this murderous little villain will destroy all the small *birds* in its neighborhood, from the flickers and doves to the tiny warblers It is partial to chickens and often exterminates whole broods

Cooper's hawk, which is about one third larger than the sharp-shinned is even more fierce and destructive It will snatch a young chicken before the eyes of the farmer It not only carries off good sized fowls but even grouse and rabbits

The goshawk is twice as large as the sharp-shinned, and is the boldest and most destructive hawk. This bird has been known to snatch a wounded game-bird from beneath the feet of the hunter. The young goshawk, which is even bolder than its elders, is sometimes confused with the harmless red-tailed hawk, because of its brownish plumage. Fortunately these savage birds are rarely seen in the United States except in winter, as they spend the warm seasons in the far North.

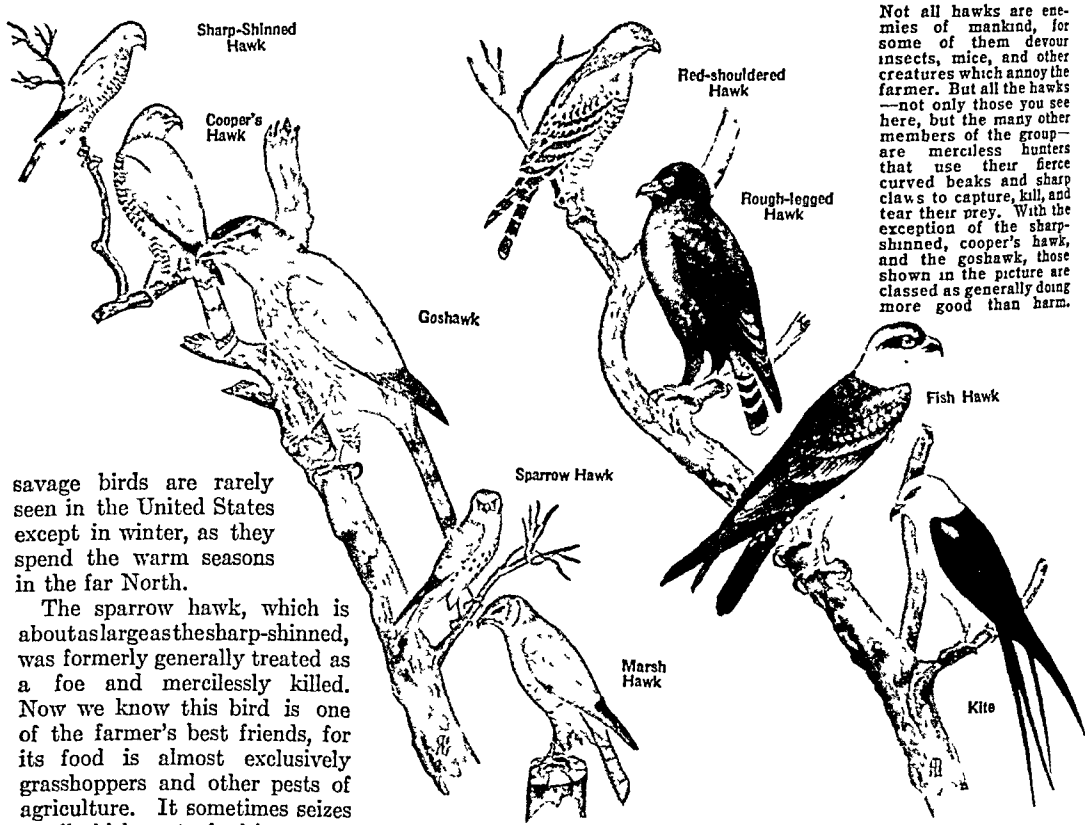
The sparrow hawk, which is about as large as the sharp-shinned, was formerly generally treated as a foe and mercilessly killed. Now we know this bird is one of the farmer's best friends, for its food is almost exclusively grasshoppers and other pests of agriculture. It sometimes seizes small chickens to feed its young, but the damage it does is nothing in comparison with its services.

The sparrow hawk is one of the varieties properly classed as *falcons*. These are distinguished from other hawks by having the beak hooked at the point, with a notch or tooth on the cutting edge of the upper mandible. They are the most perfectly developed of all birds, remarkable for their strength, symmetry, and powers of flight, and were the birds chiefly employed in the sport of falconry, which was one of the most popular amusements of the Middle Ages. With "hooded" falcons on their gloved fists, the hunters would sally forth in search of game birds. When the "quarry" was sighted, the falcon's hood was slipped and it was thrown into the air, to dart like an arrow at the prey, plunging its talons into it and crouching over it until the hunter galloped up. The most prized falcon was the peregrine or duck-hawk, which is today so rare and shy that its depredations are inconsiderable. This falcon was reserved exclusively for the use of earls, while only royalty could hunt with the great gyrfalcon. (For illustration in colors of sparrow hawk, *see* Birds.)

Nearly all of the buzzard hawks are valuable allies to the farmer and sportsman, although they have been made to suffer for the sins of their buccaneering relatives. These are mostly big heavy slow-flying birds, with long broad wings and a broad tail, while the falcons have shorter tails and long, pointed wings. Among the most serviceable varieties that should be carefully protected are the marsh hawks, which are said to destroy an average of 500 field mice apiece during the nesting season; the red-shouldered and the red-tailed hawks, often unjustly called chicken hawks, and the rough-legged hawks, which are feathered down to the toes and come to the United States in winter to range the fields in search of mice. Some of these friends of the farmer may occasionally seize a chicken to feed their young, but the damage is made up many times over by their services.

The fish hawks, or ospreys, are close relatives of the hawks and falcons, but they live exclusively on fish. They are found on all the continents near the ocean or other large bodies of water. They cannot dive, as the ducks do, but catch fish by pouncing on them

A GROUP OF FIERCE AIR PIRATES



Not all hawks are enemies of mankind, for some of them devour insects, mice, and other creatures which annoy the farmer. But all the hawks—not only those you see here, but the many other members of the group—are merciless hunters that use their fierce curved beaks and sharp claws to capture, kill, and tear their prey. With the exception of the sharp-shinned, cooper's hawk, and the goshawk, those shown in the picture are classed as generally doing more good than harm.

AN OSPREY ABOUT TO SEIZE A FISH



The osprey s strong legs and claws can seize and carry large fish You may recog nize the bird at a distance by its wh te head bordered with black stripes white breast and the bend in the wrist of the long wings which are held crooked even in fl ght

as they swim near the surface and seizing them in their talons As they fly away they hold the fish head forward A sea eagle especially a bald eagle will often rob a fish hawk of its prey by driving it higher and higher until at last the hawk tires and drops the fish (*see* Eagle)

Kites are medium sized birds closely related to the hawks The swallow tailed kites of the southern United States are among the most graceful of all b rds They seem to live almost entirely in the air soaring for hours on their long powerful wings They even p ck up food and water while in flight The head and underparts of th s bird are white the back wings and ta l black Mississippi Everglade and wh te-tailed kites are also southern birds

Kites hawks eagles and falcons belong to the suborder *Falcones* of the order *Falconiformes* Scientific name of sharp shinned ha wk *Accipiter velox velox* marsh hawk *Circus hudsonius* goshawk *Astur atricapillus* swallow tailed kite *Elanoides forficatus forficatus* osprey *Pandion haliaetus carolinensis* sparrow hawk *Falco sparverius* peregrine falcon or duck hawk *Falco peregrinus*

Hawkins Sir John (1532 1595) Among the bold seamen of Elizabethan England none ga ned a greater reputation for reck less daring than John Haw kins He was the first to defy Spain s power in the West Indies and the first to open to h s country th e commerce of the New World

John Hawkins was born in Plymouth in 1532 the son of a sea captain an l wealthy sh powner On sev eral trading tr ps to Spa n Portugal and the Canary Islands young Hawkins heard fascinat ng tales of r ches that lay across the Western Sea He determined to share n them without car ing much l ow he went about it In 1562 he sailed to Af rica where he acqu red 300 Negroes by the sword and other means Then he set forth for Santo Dom ngo in the West Indies to trade his cargo for pearls hides ginger and sugar The Span sh colonists were forbid den by Spa n to trade with any foreign nat on but they were as eager to buy the slaves as Hawkins was to sell them When necessary Hawkins persuaded them to meet his terms by force of arms

On Hawkins third voyage (1567–68) his cousin Francis Drake commanded the third and smallest vessel of the fleet (*see* Drake) Hawkins committed vari ous acts that would be called piracy today before he

boldly sailed his fleet into the harbor of Vera Cruz, in Mexico. The next day an armed Spanish fleet arrived in the port. In the fight that followed, Hawkins lost many sailors and one ship.

For the next 20 years he remained at home in the service of Queen Elizabeth I, building up her navy in anticipation of the coming conflict with Spain for supremacy of the seas. As treasurer and comptroller of the navy he managed the whole naval force of the nation. He redesigned vessels and introduced many of his own inventions, worked out in practical experience at sea. In the great battle in which the Spanish Armada was defeated (1588) Hawkins served as a vice admiral and was knighted for gallantry.

In 1595 he sailed with Drake on what was to be the last voyage for both men. Old and sick, he joined the expedition to attempt the rescue of his only son, Richard, who was a captive of the Spanish at Lima, Peru. He died off the coast of Puerto Rico.

HAWTHORN. The white glory of the English countryside when the hawthorn bursts into bloom has inspired the song of many a poet. The English tree has been introduced into the United States, but the many native American species are no less beautiful.

Hawthorns are low, shrubby, thorny trees, seldom more than 25 feet tall. They are favorites for hedgerows and ornamental plantings in gardens, where they do best in sunny locations and in limestone soil enriched with loam. In the spring they are masses of white, pink, or crimson blossoms, which show the close relationship of the hawthorns to the rose family. The flowers are followed by red fruit, like miniature apples, known as "haws" or "thorn apples." The fruit of some of the more southerly species may be made into jellies and preserves. The wood is very hard and is valuable for making mallet and hammer handles and other implements. The English often call the hawthorn the "may tree," and use the flowering branches for May Day decorations.

The hawthorns are widely distributed through the temperate regions of the Northern Hemisphere. In North America alone there are more than 900 species; Europe has about 60 species. The name of the genus *Crataegus* comes from the Greek word *kratos*, meaning "strength," referring to the hard wood. Scientific name of the English hawthorn, *Crataegus oxyacantha;* the red haw, or scarlet haw of southern Canada and northern United States, is *Crataegus intricata*. The state flower of Missouri is *Crataegus mollis*. The so-called "black haw" is the sweet viburnum of the honeysuckle family.

NATHANIEL HAWTHORNE AT 46



This photograph of Hawthorne was made in 1850, the year the 'Scarlet Letter' was published. He was a man of medium height and slight but athletic build. His hair was almost black, his eyes dark blue and astonishingly brilliant.

HAWTHORNE, NATHANIEL (1804–1864). "Hawthorne," says an American critic, "is without doubt the most perfect workman of all American men of letters." No one questions his right to the title of a genius. He was a true artist who took time and pains to make his language the fitting expression of his thought. Finely sensitive to beauty, his style is delicate, simple, and pure. He had also a gift of penetrating insight into human hearts.

A native of Salem, Mass., he was a true New Englander, his ancestors having come to the New World in 1630. Born and bred in Puritanism, steeped in its legends and tradition, Hawthorne interpreted the Puritan spirit as no one else did. His greatest book, 'The Scarlet Letter', is the story of sin and punishment and repentance in old Salem. 'The House of the Seven Gables' was somewhat like the home of his own childhood—solitary, gloomy, haunted by an ancestral curse.

His father, a sea captain, died when the boy was four years old. His grief-stricken mother retired into a lonely world of her own. She did not even take her meals with her son and two little daughters. When Nathaniel was nine years old he broke his foot, and for nearly two years was confined to the house with only his books and his sisters for companionship. The brooding, mirthless home turned his thoughts inward. He developed a shyness and reserve that he never overcame. A year in the forested wilderness of Sebago Lake, Me., when he was 14, gave him an intimate appreciation of nature and increased his love of solitude. He attended Bowdoin College from 1821 to 1825.

After Hawthorne left college he returned to Salem, where he lived almost like a hermit until he was 33. Though he published little, this long quiet time of preparation doubtless accounts for his depth of thought and perfection of style, for there is never anything crude or immature about his writing.

For a time Hawthorne lived at Brook Farm, where a group of literary men and women were trying an experiment in communal life, and from this he got the idea for his 'Blithedale Romance'. He married Miss Sophia Peabody in 1842 and for a time they lived in Concord, Mass., in the "Old Manse," in intimate friendship with Thoreau, Emerson, and Margaret Fuller. Then, because he could not earn enough by writing to support his family, he took a position in the Salem custom house. Under the

influence of the old atmosphere that had so strongly touched his imagination his thoughts began to take definite shape in the story that made him famous The Scarlet Letter (1850) After it was published as he said ' fame was won and his future was secure

When Franklin Pierce became president he sent his old classmate as consul to England so Hawthorne had a chance for European travel visiting also France and Italy Broken by ill health and saddened by the Civil War he did not live many years after his return in 1860 The Dolliver Romance he had never finished, and the manuscript was buried with him

None of Hawthorne s novels could be called bright and cheerful though they have touches of quiet humor They are overhung with a sense of mystery and unseen influences One of his *favorite themes* is sin and its growth repentance and atonement—truly Puritan subjects Many of his tales are symbols or allegories —such as The Great Stone Face On his stories for children he put the same care and thought as on his novels for older folk

Hawthorne s principal works were *Novels*— The S arlet Letter (1850) The House of the Seven Gables (1851) The Blithedale Romance (1852) The Marble Faun (1860) *Sketches and Tales*— Twice-Told Tales (1837) Mosses from an Old Manse (1846) Our Old Home (1863) *Books and Stories for Ch ld en*— Grandfather s Cha r (1841) A Wonder Book for Boys and G r s (1851) The Snow Image and Other Tales (1851) Tanglewood Tales (1852)

HAY One of the most important farm crops is hay In the United States alone about 100 m ll on to s are produced each y ear The crop is usually exceeded in value only by wheat corn and cotton

Hay is the principal winter food of cattle and horses It is cut as fodder from legumes such as clover alfalfa and soybeans and from grasses such as timothy upland grasses and midland grasses Even cereals such as rye oats and barley may be cut and cured as hay Some hayfields like alfalfa and red clover produce two or more crops in a year

To retain the sugar and other soluble matter stored in the stalk and leaves, hay must be cut while it is still in flower and before the seed matures If left standing too long the stems and leaves become dry and useless for feed After farmers cut hay, *they* leave it on the field several days to dry or cure in the sun. Curing develops a desirable flavor and keeps the hay from spoiling when stored To keep fresh-cut hay from drying too rapidly farmers rake it *into* windrows or put *it up in cocks Cured hay* is stored either in bulk or in bales Bulk hay is loaded in racks for hauling to the barn or stack. S de-delivery rakes hay tedders and automatic loaders do most of this work To make storage and transportation easier farmers may press hay into bales in the field

When hay lies drying in the field heavy rains can ruin the entire crop Many farmers now avoid this loss by artificially curing the hay in scientifically ventilated hay mows Good ventilation is needed to keep the hay from heating and perhaps catching fire. Another method consists of cutting and chopping the hay while it is still very green After one day of drying this hay is put up in silos There fermentation changes it into silage (*see* Silo)

The chief hay producing states are Wisconsin Minnesota New York California Iowa and Nebraska

HAYDN FRANZ JOSEPH (1732 1809) The nick name Papa Haydn by which this great musician was familiarly known expresses the deep affection in which he was held by all who knew him He was a real father to his associates as he was to all young and struggling men of talent

Haydn s father a mechanic of the town of Rohrau in lower Austria was a man of refined tastes He was fond of music and the evenings of Haydn s early childhood were *spent listening to his father play the* harp while his mother sang the folksongs of Hungary the themes of which later found their way into some of the finest compositions of the master The child showed marked ability along musical lines and at the age of eight was made a chorister in the chapel of St Stephen in Vienna Here for nine years he sang and studied but at the age of 17 his voice broke Because of some boyish prank, he was expelled from the school and found himself penniless in the streets Ten long hard years followed Hungry, cold ragged but always devoted to the art of music Haydn struggled against poverty and at last fortune smiled He was made director of the orchestra of Prince Esterhazy at that time the finest in Austria and for 30 years he held this position During this time his compos tions were most numerous and his fame as a composer spread to Leipzig Paris and even London

The friendship which sprang up at this period between Haydn and the great Mozart was one of *great moment for both the composers Mozart was* so frank in his recognition of the elder man s work that he said he never heard one of Haydn s composi tions without learning something from it and called him the greatest composer in the world Haydn profited no less from the association for it was from Mozart that he derived much of the mastery of orchestral effect that marks his later symphonies

When 58 years of age Haydn visited England He was received with the greatest enthusiasm and Oxford University conferred on him the degree of Doctor of Music During his stay of 18 months he wrote the opera Orfeo and six of his 12 London Symphonies He spent another year in London in 1 94 9o Th s visit was as successful as the first

In his 66th year Haydn s great oratorio The Creation was produced Among the compos t ons of his declining years was the Austrian national anthem He died in Vienna during the French occupation of that city and many French officers were among the mourners at his funeral

Haydn composed a tremendous amount of music His works include 104 symphonies 31 concertos 77 string quartets 4 oratorios 53 sonatas for the piano 14 masses and scores of smaller p eces

PRESIDENT HAYES, *Valiant Fighter in War and Peace*

HAYES, RUTHERFORD BIRCHARD (1822–1893). "The name of Hayes began by valor," wrote a member of the Hayes family in the 17th century, and the family tradition was worthily carried on by Rutherford B. Hayes, the 19th president of the United States. On the battlefields of the Civil War, and equally in the White House at Washington, he displayed conspicuous bravery in overcoming difficulties and in fighting against great odds.

Hayes's administration is especially noteworthy for being ushered in by a dispute concerning the presidential election, which was so bitterly contested that civil war loomed as a possibility. This was the only time in the history of the country that such a danger threatened, except when war actually came with Lincoln's administration. Hayes's term of office was also marked by the ending of the Reconstruction Period in the South through the withdrawal of federal troops, by the resumption of specie payments, and by the passage of the Bland-Allison silver act.



RUTHERFORD B. HAYES

Contributions to Education

Rutherford B. Hayes was born in Delaware, Ohio, Oct. 4, 1822, and received a good education, which enabled him to fill well all the positions in which he was placed. In 1842 he was graduated from Kenyon College (Gambier, Ohio) as valedictorian of his class; and after three years more of study, in a Columbus law office and in the law school of Harvard University, he was admitted to the bar of the State of Ohio. To the end of his life Hayes maintained his interest in education. When he was in Congress he worked to improve the Library of Congress; and after he retired from the presidency he served on the board of trustees of Ohio Wesleyan University, and of the Ohio State University. He was also a member of the board of trustees of the John F. Slater Fund for the promotion of industrial education among the Negroes, and of the Peabody Education Fund for the promotion of education in the South.

His Service in the Civil War

Hayes's early interest in the Negro was displayed when he cast his first vote for Henry Clay, in 1844, as an anti-slavery Whig. To this party he adhered until the formation of the Republican party, in 1856. He was active in politics and public affairs in Cincinnati, where he had opened a law office in 1850, and was elected city solicitor in 1858. When the Civil War broke out, following the Republican triumph in the election of Lincoln in 1860, Hayes immediately volunteered for military service, and was elected captain of a regiment which was raised by the literary club to which he belonged. He declined at this time a commission as colonel which President Lincoln sent him, but later accepted a major's commission. His courage on the battlefield was conspicuous, as was proved by several wounds received in notable engagements and his conduct in the battle of Winchester (Sept. 19, 1864), where he led his brigade through a deep slough in the face of the enemy. This gallant action won for him the admiration of his men, and the rank of brigadier general. He was promoted later to the rank of major general of volunteers.

While he was still in the field (August 1864) he was nominated for Congress from his home district in Cincinnati, Ohio. A friend urged him to apply for leave of absence that he might campaign for the position, but Hayes refused, saying: "An officer fit for duty who, at this crisis, would abandon his post to electioneer for a seat in Congress ought to be scalped." Without any effort on his part he was elected and served with ability. In 1866 he was re-elected, and before his second term had expired, he resigned to become governor of Ohio. Three times he was called upon to act as governor of that state. The last time he was elected (in 1875) he stood on a platform calling for "sound money," in opposition to the Democratic policy of indefinitely postponing the resumption of specie payments and the policy of paper money.

The Famous Hayes-Tilden Election Dispute

It was Governor Hayes's position on this question that won for him the Republican nomination for the presidency in 1876 over James G. Blaine, with William A. Wheeler of New York as vice-presidential candidate. The Democratic candidate for president was Samuel J. Tilden of New York, who was also supported by many reform Republicans. Three states—Louisiana, Florida, and South Carolina—each sent in two sets of returns, one for Hayes by the "carpetbag" government, the other for Tilden, by governments set up by ex-Confederates. Both parties charged frauds on the part of their opponents. The Senate was Republican and the House Democratic, so the decision as to the disputed votes was left to an Electoral Commission, composed of five senators, five representatives, and five justices of the Supreme Court. The decision—by a party vote of eight to seven on every question—

favored the Republicans, and Hayes was declared elected by 185 electoral votes to 184 for Tilden Party feeling ran high, and some hotheads urged the Democrats to take the government by force but President Grant placed troops where they might be used if needed and the inauguration took place peacefully The United States passed out of the period of the Civil War and into an era of prosperity, business development, national aspiration and class controversy Hayes's right to be president was criticized many Democrats asserting that the Republicans had stolen the office An investigating committee of the House of Representatives declared that Tilden was rightfully elected, but a Republican Senate committee found evidence of a Democratic plan to bribe election officials in *two of the Southern states* Evidently both parties had soiled hands and the attacks on Hayes's integrity fell flat

A Strong Cabinet

Most of the men Hayes chose for his cabinet were of exceptional quality William M Evarts, the secretary of state was one of the greatest lawyers in the country He had been President Johnson's chief counsel in the impeachment proceedings, served (1868–69) as attorney general of the United States, represented the United States before the Geneva Court of Arbitration, and was chief counsel for the Republicans before the Hayes-Tilden electoral commission John Sherman, secretary of the treasury, had entered public life as an opponent of the Kansas-Nebraska Act, served as a member of the House of Representatives (1855–61), then served as senator from Ohio (1861–77) He was for ten years chairman of the Senate committee on finance, and the act of 1868 providing for resumption of specie payments was largely his work

A third important man in the cabinet was Carl Schurz, secretary of the interior Schurz was a notable example of the opportunity offered by *the United* States to refugees from Europe Born in Germany, highly educated, and a skilled musician he was forced out of Germany as a result of his activities *in the German* revolutionary movement of 1848 He was only 23 when he emigrated to the United States, but by the time he was 30 he was one of the leading *citizens of* Wisconsin As a convinced liberal he early joined the Republican party, made campaign speeches both in English and in German, and more than any other one man helped to draw Germans into the new Republican party In 1861 Lincoln made him minister to Spain, but he resigned after a year to become a brigadier general (later promoted to major general) in the Union army After the war he edited a daily paper, first in Detroit and later in St Louis In 1869 he was elected to the Senate from Missouri and he soon became one of the most active of the reformers opposing President Grant As secretary of the interior he made special efforts to give the Indians just and humane treatment and to place the civil service on a merit basis He attacked the plunder of public timber lands and urged Americans to preserve their forests For the rest of his life (he died in New York City in 1906) he was probably the most prominent German American citizen

ADMINISTRATION OF RUTHERFORD B HAYES
1877–1881

Civil Service Reform begun

Federal troops removed from the South and Reconstruction ended (1877)

***Halifax Award in fisheries dispute* with Great Britain (1877)**

First electric lighting of streets (1877)

Use of telephones begun (1877)

Miners' strikes ("Molly McGuire" outrages) and railroad strikes (1876–77)

Right of States to regulate railroad rates upheld (1877)

Greenback Party at height of its power (1878)

Bland-Allison Silver Act passed over the President's veto (1878)

Resumption of specie payments (1879)

Exodus of southern freedmen to *northern states* (1879–80)

Not renominated because he had opposed Congressional leaders

End of "Carpetbag" Rule

Whether Hayes or Tilden was elected the Civil War was over, for both candidates had made up their minds to remove the United States troops from the South, and to leave to the Southern people the working out of their own future The 'carpetbag' politicians among Republicans objected to this and attacked Hayes bitterly for deserting them Machine politicians who had grown rich and powerful through the 'spoils system" of political appointments fought him for his continued efforts toward civil service reform His administration was full of controversy, with radical Republicans attacking his party loyalty, and with Democrats always in control of one or the other house of Congress, and obstructing measures of government sponsored by the administration Once Congress even adjourned without voting money to pay the army, and private bankers had to lend the money with which to pay the troops

Advancement in the South

But the South started on a new era, with railroads rebuilding, and with new factories manufacturing much of its cotton into cloth The white people of the backward areas of the South found employment in these factories Some of the freed Negroes moved North hunting better jobs, and for a while the South feared that its labor supply would disappear Many Negroes were helped to independence by new ventures in education, of which the school at Tuskegee, Ala, directed by Booker T Washington, was most notable Booker T Washington taught his race to be frugal and industrious, and not to worry too much about their political rights and privileges (*See* Washington, Booker Taliaferro)

Prosperity came back to the United States in the administration of Hayes, but before it was well established the government had to decide whether financial policy was to be directed to secure the credit and welfare of the whole country, or to give advantage to a single class. Ever since the Civil War prices had been declining. From 1862, when legal-tender greenbacks first appeared, until 1879, when the Treasury was able to redeem them in gold, all prices were "paper" prices.

GOLD STORED TO REDEEM GREENBACKS



This 1878 cartoon pictures John Sherman, secretary of the treasury and author of the Resumption Act, guarding the gold accumulated to redeem the paper currency (greenbacks) in circulation.

Paying Debts with High-Priced Money

In 1864, when it looked as though the South might win, "paper" prices were very high, nearly three times their pre-war average. But as confidence in the ability of the government to resume the payment of gold increased, the value of greenbacks increased. This means that prices fell, because the better the money, the more it will buy, and the lower the price. The fall in prices after 1864 bore heavily upon all who owed money, for with every decline it took more bushels of wheat, or bales of cotton, to pay a debt. This made it hard for the farmers of the West, where heavy debts were incurred in setting up new farms, and for those of the South, where the landowners, depressed by warfare and defeat, had been obliged to borrow money to rehabilitate their plantations. Some leaders urged postponing the resumption of specie payments; some wanted it abandoned and yet more paper money issued by the government, so as to lessen its value and make prices high. Some even wanted to pay the whole national debt in "fiat" money. The panic of 1873 increased the number of those whose burden of debts made it hard for them to face a fall in prices.

In the Middle West a Greenback party soon appeared, and there was a Greenback candidate (Peter Cooper) for the presidency in 1876. Hayes was devoted to sound money, and to resumption at as early a date as possible, and prevented Congress from repealing the law fixing January 1879 as the date for this. His secretary of the treasury, John Sherman, began to gather gold in the Treasury to redeem the greenbacks. The movement to prevent resumption had some support from labor while the depression lasted and there was much unemployment. In 1878 the Greenback-Labor party elected 14 congressmen.

The Bland-Allison Act

In the same year the opponents of resumption added to the amount of cheap money in circulation by passing, over the veto of Hayes, the Bland-Allison Act. It directed the United States to buy each month at least $2,000,000 worth of silver, and to coin it into standard silver dollars 16 times as heavy as the gold dollar. Owners of silver mines in the West supported this, as did the Greenbackers, because the silver dollars (whose bullion value was about 90 cents) would provide more and cheaper money. But in spite of all obstruction Hayes carried out resumption, and the United States redeemed in good faith its promise to pay the greenbacks in coin. Never since 1879 has its credit weakened. Its refusal to make shifty evasions

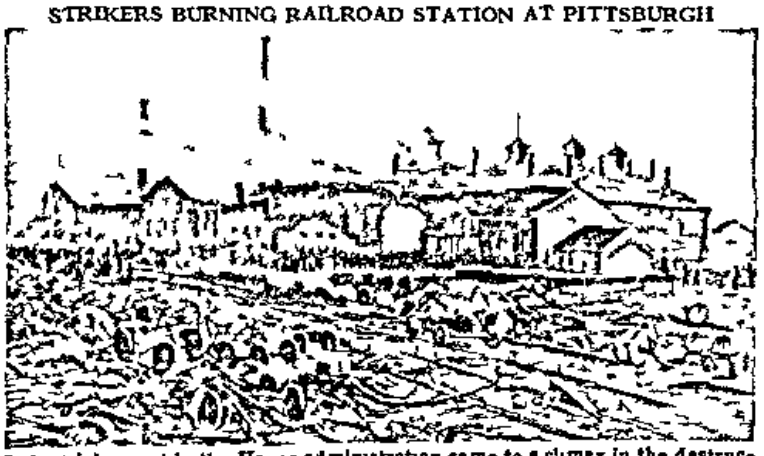
THE TELEPHONE IN USE—A TRIUMPH OF THE HAYES PERIOD



This cartoon of 1877 pictures Alexander Graham Bell and points out the benefits industry derived from the introduction of his telephone. Transmitter and receiver of the first instruments were alike, you may notice.

of its obligations has made it easier for the government to borrow whatever it has needed Those who had property were indeed helped by this action that kept the value of the dollar high, those who owed money found their burdens increased But the United States refused to violate its obligations in order to help even a class of deserving debtors

STRIKERS BURNING RAILROAD STATION AT PITTSBURGH



Industrial unrest in the Hayes administration came to a climax in the destruction of thousands of dollars worth of railroad property at Pittsburgh The artist pictures the station burning, with wreckage of cars strewn all about. Federal troops suppressed the riots.

With national credit assured, prosperity became general after 1879 The railroads resumed building, which they had stopped in 1873, and in the cities there was construction of houses and factories to accommodate the growing industries About this time the telephone and electric light came into use Many new inventions found a large market, lightened labor for the worker, and increased the profits of the manufacturer. Kerosene was used generally as an illuminant The camera was popularized The great fortunes of the railroad magnates, the manufacturers, and the bankers increased in size, and before long a problem of monopoly was raised and became of public interest.

Capital and Labor

While the foundations of this prosperity were being laid, the relations of capital and labor came to the front American labor, certain to become class-conscious as the factories increased, awakened earlier through the influence of immigration Many of the immigrant workers had belonged to unions at home, and some were Socialists Some of them had been forced out of Europe for their radical ideas, and within the American body of workers they were an aggressive group In 1877 there were violent strikes on the "trunk-line" railroads, as those lines connecting tidewater with the Mississippi Valley were called The *men struck for better* wages and against the increase in the size of trains, which more powerful locomotives were now able to haul When they struck, many were discharged Crowds of men out of work, and of disorganized hangers-on sometimes fought with the new employees, or destroyed stations, sheds, and cars Militia, called out *to maintain* order, was not able to do it Finally, Hayes sent United States troops to the railroad *centers, where* by their authority, rather than by force, they produced order at *once* The strikes faded out, but an organized labor movement lasted, and the old and secret Knights of Labor were soon *joined by the* American Federation of Labor, while local and craft unions multiplied in the period that was beginning

In the 15 years after Hayes became president, the United States increased in prosperity, but lost much of the simplicity of life that prevailed before the Civil War It was shifting from agriculture to industry. More people were moving to the cities, and on the farms fewer hands were producing an increasing output, by using machinery. The farmer began to send his children to the state agricultural colleges that had been founded under the Morrill Act, and to demand more instruction and aid from the United States government—aid that came when a Department of Agriculture was created in 1889

President Hayes, himself, when he retired from office, gave freely of his time to educational work, and to philanthropic ventures like the National Prison Reform Association He was fortunate in having enough money to let him live as he pleased, and his home, Spiegel Grove, near Fremont, Ohio, became a center of hospitality and useful influence His old army friends and the soldiers of his command were always welcome there He was proud of having signed, for their benefit, an Arrears of Pensions Bill that increased the allowance given to disabled veterans No Union soldier, he said, "ought ever to be forced to choose between starvation and the poorhouse" He died at Spiegel Grove, Jan 17, 1893, after a short illness

HAZEL Although the hazel furnishes effective little rods for hoops and baskets and crates, it is known chiefly for its nuts Some cultivated varieties grown in Europe, such as the filbert, are collected for the market, but the two woodland species that grow in North America are mere shrubs or bushes and the nuts have little market value These nuts lie in leafy cups in clusters of two, three, or four, and from their light brown shade we get the color term "hazel" The oil pressed from hazelnuts is used by perfumers and painters and *in medicine*

In certain European lands the forked hazel twig was once believed to be a magic divining rod that could point to the place where precious minerals or other objects lay hidden, or where water might be found by well diggers In North America this power was ascribed to an entirely different shrub—the witch-hazel

The hazels belong to the birch family (*Betulaceae*) Scientific name of common hazel, *Corylus avellana* of American hazel, *Corylus americana*.

YOUR HEALTH *and* HOW TO KEEP IT



HEALTH. Our most valuable possession is good health. But what is health? The word means "whole and sound," hence free from injury and disease. But good health means more than mere freedom from injury and disease. For good health, every part of the body and the mind as well must be in fine working order.

The science of preserving health is called *hygiene*. The word comes from the name of the ancient Greek goddess of health, Hygeia. We can appreciate our own ways for keeping healthy if we know some of the Greek ideas about health.

The Greek Gods of Health

The ancient Greeks believed that disease was a punishment sent by the god Apollo when he was angry. At first, the only way to get well was to pray to the god. But then other gods came to help.

Apollo had a son named Aesculapius, who learned how to heal sickness from the centaur Chiron. For a time Aesculapius lived on earth and kept people so healthy that nobody died. But Hades, the god of the underworld, complained to Zeus that no one was coming to his region. Zeus satisfied Hades by killing Aesculapius with a thunderbolt. Then he satisfied Apollo by making Aesculapius the god of medicine. After that, Aesculapius watched over men from the heavens and answered their prayers for health.

He had two daughters who helped him. One daughter was named Panacea. She became the goddess of healing. (We still use her name to mean a remedy for all diseases. Of course, such a remedy is as mythical as Panacea herself.) Another daughter, named Hygeia, helped to keep people well. The Greeks built temples to honor Aesculapius, Panacea, and Hygeia. They brought their sick to these temples and to the temples of Apollo. These served as hospitals and the priests served as doctors.

Our Modern View

Today we do not believe that disease comes from angry gods. We believe that it comes when something goes wrong in the body, or disease germs attack us, or we live in unhealthy ways. And we do not pray to a goddess for health. We try to avoid the causes of disease. So for us, hygiene means two things. We must prevent disease and injury and we must promote good health by living wisely.

Our practise of hygiene has two broad divisions. We call our measures to help the community "public health" (*see* Health Department). Our measures to help individuals are "personal hygiene."

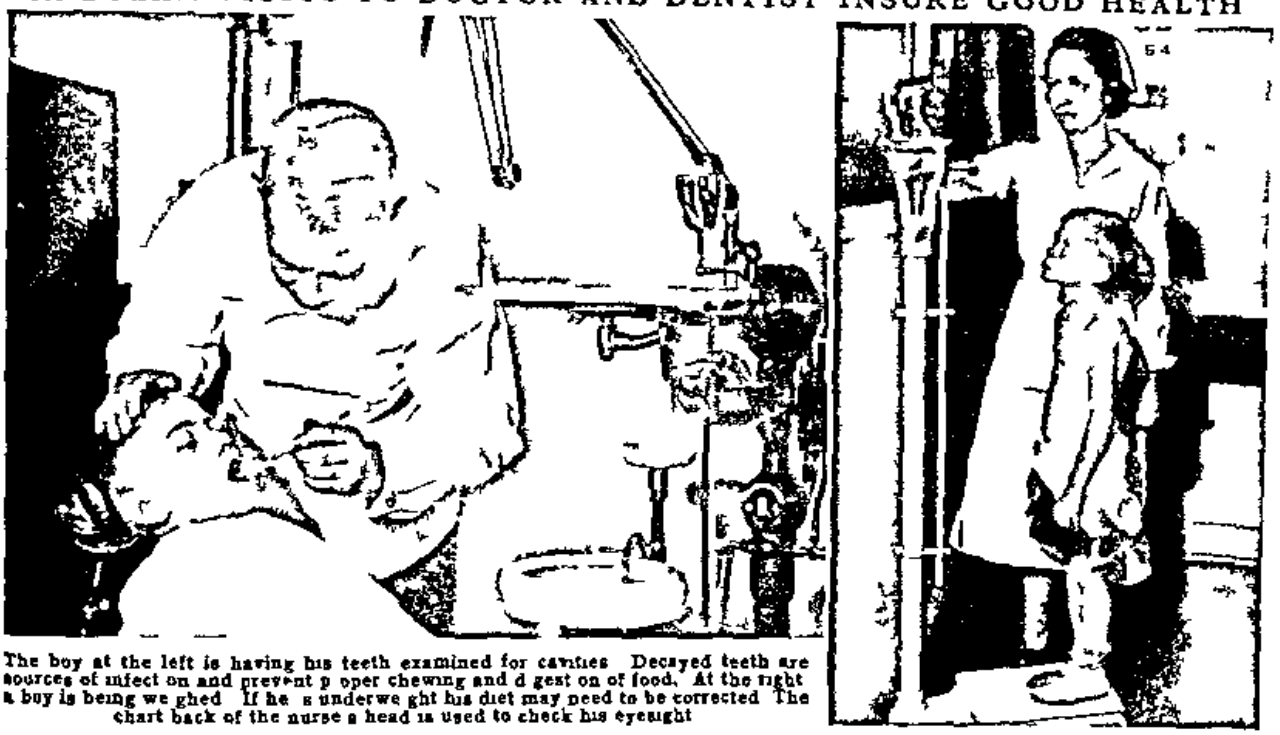


Fresh air, exercise, and cleanliness are three "musts" for good health. The recess period at school should be spent out of doors in active play whenever the weather permits. Between school and dinner time some outdoor play is wise. At camp as well as at home face and hands should always be washed before meals.

Community Hygiene

Community hygiene consists of measures which promote health among all citizens. The Federal government's Pure Food Laws are one example (*see* Pure Food Laws). Each state has laws to safeguard food. Most cities have health laws and a health department to enforce them. Cities purify water and dispose of sewage and garbage to help prevent epidemic diseases such as typhoid (*see* Sewerage; Water Supply). Some cities examine school children for tuberculosis. Most of them require vaccination. Health officers inspect public eating places and try to check infestation by rats and other vermin

REGULAR VISITS TO DOCTOR AND DENTIST INSURE GOOD HEALTH



The boy at the left is having his teeth examined for cavities Decayed teeth are sources of infect on and prevent p oper chewing and d gest on of food. At the right a boy is being we ghed If he s underwe ght his diet may need to be corrected The chart back of the nurse s head is used to check his eyesight

Such measures can make modern cities reasonably free from general dangers to health But they cannot keep individuals from injuring their own health A city can furn sh pure water but it cannot keep its people from drinking at country streams which may contain typhoid germs No laws can keep anyone from straining his eyes under improper light Laws cannot keep people from overeating or undereating standing incorrectly exercising too little or too much or letting teeth become decayed and infected Laws cannot force people to get sufficient sleep and to cover their mouths when they sneeze or cough in public.

SEE WHAT A SNEEZE CAN DO!



Every time you sneeze without covering your mouth with a handkerchief, you infect the air about you w th millions of germs This photograph of a sneeze was made with a special h gh-speed came a by Prof M W Jennison of the Department of B ology and Public Health Massachusetts Inst tute of Technology It shows a c oud of droplets, heavy w th bacteria being d ven outwa d two or three feet. The drop ets evaporate leaving the bacteria *suspended in* the air to be scattered far and wide by air currents. In this way head colds and other diseases are spread from person to person.

In all these ways, we can injure or ruin our own health, and imperil the health of others. Millions of people do just this every year. So while the community looks out for public health, it is important that we all know the laws of personal hygiene and observe them carefully ourselves.

What Personal Hygiene Does

It would, of course, be absurd to say that everyone by practising personal hygiene could become strong and vigorous and filled with buoyant health. Unfortunately we are not all born with the same possibilities for strength and health and vigor. Some of us are, from birth, weaker and less vigorous than others. Personal hygiene cannot make up for deficiencies of this kind. But what it can do is to assist each individual to the fullest realization of the powers which he is capable of attaining. And in reality the handicaps of life result far more often from lack of care than from inborn defects and weaknesses.

The first step toward self-improvement in personal hygiene is to have an inventory of the body—a physical examination by a physician. In a thorough examination the physician will study every vital system of the body: the respiratory, circulatory, excretory, nervous, and digestive systems. He will inspect teeth, mouth, nose, throat, skin, and scalp. He will also consider weight, height, and posture. If he finds correctable handicaps—and at least 50 out of every 100 young people will show one or more—he will recommend the proper measures to overcome them. Such a general physical examination is needed once a year.

In addition, the routine of personal hygiene calls for a dental examination at least twice a year. In young people the teeth need especial attention, to avoid serious trouble in later life. (*See* Teeth.)

Physical and dental examinations must be carried out by physicians and dentists. But the remainder of personal hygiene lies in the hands of the individual.

Our Chief Food Requirements

One of the most obvious demands of the body is for food. But unfortunately the body does not tell us what sort of food shall be eaten: it simply demands enough of any kind to satisfy hunger. The selection of the proper foods and the development of the proper food habits must be guided by a knowledge of diet and of the workings of the digestive system. (*See* Food.)

Food is the sole source of energy for all activities of the body and mind. A good diet supplies not only energy but also all materials needed for growth, repair, and proper functioning of the body.

In brief, the requirements for a complete diet are these:

1. Enough fuel foods to give the body the energy it needs.
2. Enough protein to replace that lost in the wear and tear of living activity.
3. Enough minerals to keep the bodily store adequate for good health.
4. Enough vitamins to prevent disease and to maintain good bodily function.
5. Enough roughage to allow the intestines to carry out proper elimination.

Fuel foods include the sugars, starches, fats, and proteins. Bread, potatoes, beans, macaroni, cereals butter, olive oil, milk, and all sorts of meats are fuel foods.

Proteins are found in meats, cheese, and milk, to a less extent in bread, cereals, and beans, and to a still lesser extent in other vegetables.

The *minerals* that the body needs are many, but all except two are supplied by any reasonable sort of diet. These two are lime and iron.

The best source of lime is milk. Milk should, for this reason if for no other, be a part of everyone's diet A quart a day is best, for most people. But it is not necessary to drink all of this quart; much of it may be obtained from soups, creamed vegetables, custards, and many other dishes, if they are made with milk.

Iron is needed to allow the body to make the red material which gives the blood its color and which has the important function of carrying oxygen. Foods rich in iron are molasses, beans, peas, shredded wheat, spinach, oatmeal, and prunes. Red meat also contains iron, but meat that has had the blood washed from it contains very little.

Vitamins and Roughage

When *vitamins* are absent from the diet, serious diseases such as scurvy, rickets, and beri-beri develop, when the vitamins are present but are inadequate in amount, growth fails to proceed normally and there is susceptibility to infection and loss of bodily vigor. Most of the needed vitamins are found in fruit, milk, butter, leafy vegetables, and tomatoes. But there is one vitamin that the body makes for itself if the skin is exposed to sunlight. Where sunlight is lacking it is necessary to supply children with this vitamin, obtained in the oil from fish livers. (*See* Vitamins.)

The final requirement of the normal diet is *roughage*. Roughage is indigestible material, such as a portion of the pulp of fruit, of lettuce, and all other leafy vegetables. If the diet contains only foods that are digested and absorbed completely, such as eggs, meat, butter, and sugar, there is no residue for the intestines to move along and thus flush and clean themselves.

Laxatives and physics of all kinds are poor substitutes for proper diet. When they are needed they are best taken only under the direction of a physician, for in some conditions they may be dangerous. Never should a physic be taken when there is a pain in the abdomen, unless the physician has made an examination and found the appendix to be normal. If the pain is due to appendicitis, a physic may make the disease worse and even cause the rupturing of the appendix.

Diet and the Control of Weight

Many false beliefs and fads have grown up about diet. But sensible people disregard all fads. They select their diet with a knowledge of what their bodies need. Everyone who is interested in personal hygiene soon learns that likes and dislikes for this food or that have no place in the lives of those who truly seek good health. And besides, the liking for any food quickly comes with the eating.

The control of weight is closely connected with diet When one eats more of the fuel foods than the body needs the excess is stored away as fat and weight is gained When too little of these foods is eaten the fat of the body is used up and weight is lost Young people who are of normal weight appear more resistant to certain infectious diseases than do those who are underweight But sometimes so much fat is put on that it is desirable to remove some The only way it can be removed is by using up in exercise more energy than the food supplies

During dieting the body needs as much protein minerals vitamins and roughage as at any other time The supply of these substances must be carefully maintained The only change to be made in the diet is to reduce the amount of starches sugars and fats 'Dieting fads may be dangerous to health and in reducing weight it is always safest to have a physician outline the diet

How Many Meals a Day?

How often one should eat is a question raised in hygiene Frequently it is answered by saying that three meals a day is the proper number and that nothing should be eaten between meals or before going to bed But newer knowledge on the subject indicates that the body is more efficient when food is taken in five or six meals Fatigue and irritability appearing in the late morning and late afternoon often arise from a need of food Though custom and convenience support the three-meal program many nutrition specialists recommend the following schedule

1 Breakfast
2 Mid morning lunch
3 Noon meal
4. Mid afternoon lunch
5 Evening meal
6 Bedtime lunch

But in following this schedule of five or six meals a day there is one important caution to be borne in mind The mid morning and mid-afternoon lunches are a part of the daily diet Because of them less food will be eaten at the regular meals Consequently these lunches must not be made up of candy and soft drinks and ice cream sodas They should consist of milk sandwiches fruit soup and other articles that fit into the total daily diet

Many people condemn the lunch before going to bed But their belief in its ill effects is based upon the kind of food eaten and not the time at which it is eaten Pickles cheese sandwiches Welsh rarebit and other dishes hard to digest are certainly not desirable just before going to bed. The articles chosen should be those that might be eaten with comfort for breakfast warm milk and crackers custard toast fruit and the like

Vital Importance of Chewing

No matter at what time food is eaten there is one positive rule of hygiene about *the eating* The food must be chewed thoroughly and for two excellent reasons. First, after the food leaves the *mouth* all digestion is chemical (*see* Digestion) Digestive juices poured over it act upon it to dissolve it The smaller the particles the easier is digestion There are no teeth in the stomach or intestines and so when the food leaves the mouth there is no further chance for it to be divided into smaller particles

The second reason lies in the fact that one of the digestive juices is mixed with the food in the mouth This juice is saliva which digests starch When the food reaches the stomach this digestion by the saliva continues for an hour or more before the stomach juices reach the food and stop the action of the saliva If the food is insufficiently mixed with saliva by chewing the salivary digestion cannot take place and the food tends to sour in the stomach.

The old belief that water should not be drunk at mealtimes has as its only basis this fact Many persons treat their food like pills and wash it down with a drink of water instead of chewing it Water in any quantity is perfectly harmless at meals provided it is drunk only when the mouth is empty and the water is not used to moisten or wash down dry foods And milk we should remember must be treated not as a drink but as a solid food for it becomes solid in the stomach. To prevent indigestion milk must be chewed by taking it in small swallows

We know too that neither the saliva of the mouth nor the digestive juices of the stomach can be secreted well if the emotions are upset or if the mind is concentrating An important rule of hygiene says that for good digestion meals should be eaten in peace of mind and comfort of thought Hence it is harmful to study at meals or to scold and tease anyone Rather for best digestion meal time should be a time to joke laugh and carry on pleasant conversation

Allergy and Food Poisoning

Certain foods which most people can eat and enjoy cause illness in occasional individuals They become nauseated they may even develop a skin eruption called hives This rare disturbance (called allergy) is closely related to hay fever But there is no ground for the belief that certain articles of food cause indigestion if they are mixed together Thus many persons refuse to drink lemonade and milk in the same meal or eat ice cream after lobster The fact is however that any food that can be eaten and digested in comfort can be taken without danger in the same meal—or even in the same dish—with any other food that can be eaten and digested in comfort Food mixtures upset the stomach only when one or more of the ingredients is indigestible or spoiled

Food poisoning results when the food eaten is spoiled infected with bacteria or contains a poisonous substance Thus toadstools eaten by mistake for mushrooms cause food poisoning because the toadstools are themselves poisonous Again food that has spoiled contains not only bacteria but the poisonous chemical substances that result from the action of the bacteria But by far the commonest type of food poisoning results from human contamination. There

are certain dangerous bacteria that may sometimes be present on dirty hands. If the hands touch the food, the food is contaminated. If the food is eaten, food poisoning results. These bacteria are destroyed by heat. Therefore this type of food poisoning comes most often from cold foods that require handling, such as sliced meats, sandwiches, and deviled eggs.

Because of the dangers of food poisoning, great care must be taken in handling food. The kitchen must be scrupulously clean and free from flies; the icebox clean and neat. Only healthy people should handle or serve food and their hands should be washed and their finger-nails cleaned before they touch any food or even any dishes. And finally, the dishes should not only be washed to make them look clean, but scrubbed and scalded in hot water to remove bacteria and then thoroughly dried.

Another type of poisoning may result from the use of alcohol or coffee or tobacco. Alcohol is an anesthetic. It acts on the body in the same way as does the ether used to produce unconsciousness for surgical operations. Coffee contains a drug called caffein, which stimulates and irritates the nerves. Tobacco contains a drug called nicotine, that also acts on the nerves. All three of these drugs, however, are far more harmful to young people than to adults.

Facts About the Air We Breathe

Of equal importance with food in supporting life is the air we breathe. In the lungs the blood takes part of the oxygen from the air and in turn puts into the air a gas called carbon dioxide (*see* Respiration). This is the same gas that forms bubbles in soda water and ginger ale (*see* Carbon Dioxide).

At one time it was believed that what is called "bad air" in poorly ventilated rooms resulted from the continual removal of oxygen and the continual addition of carbon dioxide by people breathing in the room. We know now that oxygen and carbon dioxide pass through plaster and brick and wooden walls so rapidly that there is never any danger of the air in a room containing too little oxygen or too much carbon dioxide.

Regarding oxygen in the air, therefore, the rules of hygiene have little to say. But they have much to say regarding other substances in the air. Dust, bacteria, pollen, and poisonous gases may all make air harmful to breathe.

All air contains some dust. The small amount normally present is removed in the nose and, to a less extent, in the windpipe. These passages thus protect the delicate structure of the lungs from irritation by dust. If breathing is through the mouth instead of the nose, part of this protection is lost.

When there are large amounts of dust in the air the nose and throat themselves may be irritated. The air in houses usually contains far more dust than does the outside air. Removing dust thus becomes a part of hygiene in the house. One of the most satisfactory ways of reducing the dust is to use a vacuum cleaner instead of a broom. The cleaner removes the dust; the broom stirs it up.

The presence of poisonous gases in the air is a far more serious matter than is the presence of dust. In the house there are two main sources from which dangerous gases may come: the coal furnace or stove, and the gas stove, gas jet, and gas water heater. In the garage is a third source—the automobile.

Automobile exhaust gas is very poisonous. It contains carbon monoxide (do not confuse it with carbon dioxide mentioned above). An automobile should never be run in the garage for a single instant unless the doors are wide open. Many lives have been lost because of ignorance of this fact.

The same dangerous gas may come from the furnace or coal stove. Carbon monoxide is nearly always present in coal smoke, especially when the fire has been banked and the dampers closed. If smoke finds its way into the house through a faulty flue or chimney, or from a crack in the firepot of the stove or furnace, it carries with it the carbon monoxide. Good hygiene includes the regular inspection of all household equipment and the immediate repair of any defects that are found to prevent such an occurrence.

This same carbon monoxide is also the poisonous part of illuminating gas used for cooking, heating, and lighting. If illuminating gas escapes unburned, its dangerous carbon monoxide finds its way into the air of the rooms. But illuminating gas is harmless when burned, and can be used with perfect safety by those who know its dangers and guard against them. There are a few special don'ts that everyone should know:

1. Don't use a rubber tube on any type of gas fixture. The hose is easily pulled off, allowing the gas to escape.
2. Don't allow the cocks on the burners of the stove to become loose so that they may jar open.
3. Don't allow a small child to play near a gas stove. He may in ignorance turn on the gas.
4. Don't allow food or water to boil over on the stove. It may put out the flame but it does not turn out the gas.

The Real Purpose of Ventilation

The air of all rooms, as was said above, has plenty of oxygen, it never has a harmful amount of carbon dioxide, and it rarely has in it the dangerous poisonous gases. Yet for good hygiene it is always necessary to ventilate rooms in order to keep the air fresh (*see* Heating and Ventilating). This freshness has nothing to do with the chemical nature of the air or with breathing. "Bad air" is air that is too hot, or too moist, or too dry; and especially it is air that is too still. Air that is still and warm does not allow the body to give off its heat in comfort. Still air is depressing; moving air is invigorating. Moreover, when there is no movement the air tends to gather in layers, with the hot air near the ceiling of the room and the cold air along the floor. This condition is unhygienic.

Poor ventilation resulting in "bad air" occurs mainly in the winter time. In our northern regions it is necessary to close the windows and to heat the air of the rooms. Often the air is overheated, dry, and still. With careful attention to the heating plant—and that is a regular part of the hygiene of the house—the overheating can be prevented. The proper tem-

perature for heated air is a matter of opinion. But most authorities agree that 68° F *is as warm as it* should be If the air can be well moistened the temperature may be kept as low as 62° or 65° Older people require warmer air than is comfortable or even healthful for young and active people

Bedrooms should be kept cool at night and well ventilated by means of a partially opened window In the past it has often been a fad with many people to keep the bedroom cold and with a breeze—often a gale—blowing through it from wide open windows This condition while harmless to those in vigorous health may be harmful to those who are ill or even to those who are troubled with frequent colds. Cold air puts a burden on the nose and throat Fresh air is needed in the bedroom but ventilation—like everything else in good hygiene—should be in moderation.

It is a common belief that drafts of cold air wet feet, and wet clothing cause people to 'catch cold' Certainly any of these conditions will make a cold much worse, they will also make the muscles stiff They are to be avoided under all circumstances But a cold is an infection Infections though they may be made worse, are not acquired by getting the feet wet They are acquired from other people who have colds Arctic explorers do not develop colds so long as they stay away from other people

How to Avoid Colds

Colds are spread by germs carried in minute droplets spread in the air during coughing and sneezing By keeping the air in motion good ventilation helps to disperse these droplets and thus aids in preventing the spread of colds Colds are rarely 'caught' out of doors but they are frequently 'caught' in poorly ventilated rooms or where people come in close contact with one another as in trains, schools and theaters

The germs that cause colds may be spread in other ways by shaking hands with a person who has a cold, by using his handkerchief by drinking from his unwashed glass and, in short by touching or using any article that he has recently touched or used To avoid colds avoid people who have colds

There are certain definite rules of hygiene to be followed by those who have caught cold

1 Avoid going near other people Do not spread your cold'

2 Go to bed on the first sign of the cold and stay there *until* it is over This is the safest and wisest treatment for a cold It is the only measure that may shorten the length of the cold And it is an almost certain method of preventing the cold from spreading deeper into the throat and lungs and causing bronchitis or pneumonia

3 Avoid getting the skin wet or chilled

4 Take the temperature with a mouth thermometer twice each day If there is fever call a doctor at once

If these simple rules of hygiene were followed there would be far fewer colds and, what is more important, far fewer cases of bronchitis and pneumonia

One of the dangers of any cold is the possibility that the infection in the nose may be forced up the minute tube (the Eustachian tube) that leads from the throat to the ear (*see* Ear) Infection of the ear may follow Not all cases of ear infection come from this cause, but many do And many of these could be avoided by a simple *rule of hygiene in* blowing the nose Never *stop up both sides of* the nose in blowing, always leave one open If both sides are closed the blowing *may force the infectious* material into the ear

If the ear canal becomes filled with wax a physician should clean it But it is dangerous to attempt to do so at home with a hairpin or the rolled up end of a towel for the wax may be pushed back *into the* canal and strike against the head of the drum There is an excellent and sarcastic German proverb on the care of the ears It is 'Never put anything smaller than the elbow in the ear" This caution however, does not mean that the outer ear should not be washed

Hygiene of the Eyes

The rules of hygiene for safeguarding the eyes are much more extensive than those for the ears The eyes are the most important of the sense organs (*see* Eye) We normally depend upon them for more than 80 per cent of our perception of our surroundings Any defect in the eyes that interferes with good seeing is thus a serious handicap to all work and pleasure Moreover, the straining to see well with defective eyes harms them still further and causes headache and irritability Defects of the eyes can usually be corrected Therefore the eyes should be examined and the vision tested once each year by an eye specialist

Even when the eyes are capable of seeing well they are often forced to work under conditions that strain and injure them The eyes especially those of young people may be strained by reading small type In all reading the head should be held up straight with the book supported upright, not laid open on the desk Rest the eyes frequently by closing them or looking off into space for a moment

Good seeing requires good lighting Poor lighting strains and injures the eyes Use daylight when possible for reading and writing and sewing When artificial lighting is necessary, the arrangement of the lights becomes an important part of hygiene

Never read or write or sew in a dim light or in a place where shadows fall across the work Always use a bright light but carefully avoid glare There are two kinds of glare, both are harmful to the eyes Direct glare results when an unshaded light shines directly into the eyes Indirect glare results from the reflection of the light on the page of the book There is a simple test for the harmful indirect glare With the book held in position for reading move a small hand mirror back and forth across the page If an image of the light bulb is seen in the mirror, indirect glare is present The book or the light should then be moved until the image of the light can no longer be seen in the mirror

Good lighting in the house not only saves the eyes from strain but helps to prevent accidents Many accidents result from falling over furniture or other obstacles in dark halls and passageways And many result from falling down dark stairways Light-colored

wall and ceiling decorations help toward better illumination. Whitewashing the cellar serves this same purpose and in addition makes it much easier to see dirt that should be removed.

Any injury to the eyes, any infection, even any redness, should be treated by a physician. The eyes are far too valuable to risk any "home treatment."

Care of Skin and Scalp

In contrast to the eyes, the skin of the body needs "home treatment" every day. This treatment is washing. Cleanliness is the most important step not only toward good health of the skin but toward good complexion as well. The skin of the whole body needs a daily cleansing with warm water and soap. The skin of the hands and face and feet need even more frequent bathing.

It is important to dry the skin thoroughly after washing. And this is particularly true in the winter time, for then wet skin chaps and roughens.

Many girls and women use cosmetics on their skin—powders, creams, and lotions. Chapped skin is soothed by putting grease on it, but the regular use of grease makes the skin tender so that it chaps easily; it may also cause pimples in young people. There are many absurd beliefs about the "beautifying" effects of cosmetics, derived largely from advertisements. The facts are that the skin cannot be fed or renewed from the outside; this can be done only from the inside. Cold cream is merely grease; vanishing cream is a sort of soap; and face powder is a dust made of starch or crushed talcum rock. Some cosmetics are actually poisonous. Real beauty of complexion comes from good health and cleanliness. Cosmetics are used mainly to cover up the blemishes that come from lack of good hygiene of the skin.

For the hair and scalp the best "tonic" is cleanliness. They should be washed at least twice a week. There is an old superstition that washing the hair harms it by taking out the grease. In reality the only harm that can come from washing is from leaving soap on the hair, from too little rinsing, or from failure to dry the hair and scalp thoroughly.

Effects of Poor Posture

Good posture, like good complexion, is a matter both of beauty and of health. The human body is not handsome when the shoulders are slouched and sagging, the back bent, and the neck thrust forward. Equally unbecoming is a slouching posture in sitting. When we see people with these bad postures we get the impression that they are tired, or lacking in energy, or weak. Sometimes it is fatigue that causes the bad posture, but more often it is carelessness and poor habits of hygiene. Moreover, bad posture affects health. Muscles are pulled and strained; the back and legs ache; and sometimes the organs in the abdomen are pushed out of place.

Clothing as well as posture plays a part in hygiene. Clothing is intended to keep the body warm, but not too warm. Therefore in winter weather it is best to wear clothing suited to the indoor temperature of our heated rooms and provide plenty of wraps, coats, leggings, and overshoes to use when going out of doors. The clothing next to the skin should always be kept dry. The underclothing should be changed frequently—daily is best—for it becomes covered with bacteria from the skin. Skin infections and unpleasant odors may result from soiled underclothing. The clothing should be loose. It is best to support it entirely from the shoulders.

This warning against tightness applies especially to shoes. Because they are stiff and firm, misfitted shoes may deform the feet. The shoes for young people who are growing need especial attention. Sometimes they become too small for safety even before they are worn out. For the best foot health, shoes should have low heels and broad toes. They should be of soft leather and ventilated to allow evaporation of perspiration.

Importance of Exercise and Sleep

Exercise is an important part of good hygiene (*see* Physical Education). If exercise is avoided, the body gradually loses its reserve of strength. The muscles become soft and flabby, and the vital organs do not carry on their functions as well as they should. Good exercise does not mean violent exercise but regular exercise. Endurance contests of any kind may be harmful to boys and girls under the age of 16 or 17. It is far better to develop a sound body for a long life than to win a few races and swimming contests in early life. Do not make work out of the daily exercise; make it a pleasure. Walking, dancing, tennis, swimming are good exercise—and so are sweeping and bed-making.

Sleep is more than a rule of good hygiene; it is a necessity. But the right amount of sleep is a matter of hygiene. Some people need more sleep than others, but a rule that suits most is:

1 to 4 years, 12 hours of sleep
4 to 12 years, 10 hours of sleep
12 to 16 years, 8 to 10 hours of sleep

No one can work or study or play well when he is tired and irritable from lack of sleep. For the hygiene of sleep the first requirement is regular hours for sleeping. The other requirements are: a comfortable bed, enough but not too many bed covers, good but not violent ventilation, and a quiet bedroom with windows shaded against the morning sun.

Personal hygiene does not end with the care of the body alone. Good mental and emotional habits are just as important as good health (*see* Mental Hygiene). Some persons are fortunate in having a warm and cheerful disposition that makes life easy for them and for those about them. Such a disposition is a gift even more precious than physical strength and beauty. Others are handicapped by dispositions that are irritable or sullen or indifferent. Such persons can go far toward overcoming their handicaps if they will make persistent efforts at self-control and self-improvement (*see* Personality).

For mental health, in the home and in all situations of life, everyone must give as well as take. Each must be considerate of others as well as of himself.

SPREADING RULES OF GOOD HEALTH



1 Girls in a nursery school in B ooklyn learn how to bathe a *baby* They are practis ng with a doll 2 A nurse shows a mother and her daughters how to make a bed She is mitering the corner to hold the undersheet taut. 3 A Red Cross nurse takes a baby to bathe and oil it 4 This nurse shows that a thermometer should be held by the tip not the bulb 5 A V s ting Nurse records facts about a family s health 6 Here one makes friends with a toddler to gain his confidence

The GUARDIANS *of the* PUBLIC HEALTH

HEALTH DEPARTMENT. When one part of the human body suffers, the whole body is likely to be affected. In the same way if sickness or unhealthful conditions prevail anywhere in a country, all the people may be threatened. An impure water supply may start an epidemic of typhoid fever; one person with diphtheria may infect hundreds of others; chemical fumes may sap the health of the workers in an entire industry. To protect people against such dangers is the duty of the national, state, and local health departments.

Organized supervision of public health has progressed along with the advances in medical science. The movement began in the latter half of the 19th century when scientists found that most of the plagues that scourged the world were caused by germs, and could be controlled by scientific procedures (*see* Disease). The first emphasis was on cleaning up the community. Among the measures undertaken were the following: sanitary sewage disposal, purification of water supplies, extermination of flies, mosquitoes, and other vermin that spread disease, quarantine against germ carriers, and inspection of milk and other foods. As a result diseases that could be controlled by environmental sanitation, such as cholera, bubonic plague, typhoid, typhus, and yellow fever, have almost disappeared from the country or, like malaria, have been greatly reduced. An outbreak of one of these diseases indicates a failure of sanitary engineering and brings public health experts to clean out the source of infection.

The Results of Preventive Medicine

One of the great allies of the public health movement has been preventive medicine, with its use of vaccines and serums to render individuals immune to many of the communicable diseases. While the person who is vaccinated thinks primarily of his own freedom from danger, his immunity is in fact a matter of public concern. It prevents him from becoming an agent in the spread of disease. Smallpox epidemics are a thing of the past because the disease can make little headway in a community where most persons have been vaccinated against it (*see* Vaccination). The spread of diphtheria has been checked by the general use of the toxoid preventive and the antitoxin cure. (*See also* Disease; Serum Therapy.)

Tuberculosis was the chief cause of death in the United States in 1900. By 1935 it had dropped to seventh place. It still leads the diseases as the cause of death among young adults. Accidents, however, cause the most deaths between 15 and 34 years of age. Influenza is one major epidemic disease that has not been controlled by medical science and public health measures. Antibiotics and serums have been helpful in treating it, and research continues.

New Standards of Public Health

Health departments have controlled the communicable diseases mainly by using the police powers of government. With the aim of protecting the lives of the whole people, they place certain restraints on the freedom of individuals. They forbid a householder or a factory owner to dump waste in a stream, or they restrict the movements of persons infected with disease germs. When they attacked the problem of tuberculosis, they found that preventive methods, such as forbidding the sale of tuberculous milk, were not enough. It was necessary to educate people in hygienic ways of living, in the importance of regular physical examinations to detect the disease in its early stages, and in getting proper treatment when it was discovered.

The great success in the fight against tuberculosis encouraged public health officials to extend their research and educational programs to noncommunicable diseases such as chronic ailments and nutritional disorders. No longer is it their sole aim to protect society from the spread of infections. Their new ideal is improved personal health for every citizen. That this will lead to a stronger, more productive nation is indicated by the estimate that every day of the year some six million people in the United States are too sick to go to work.

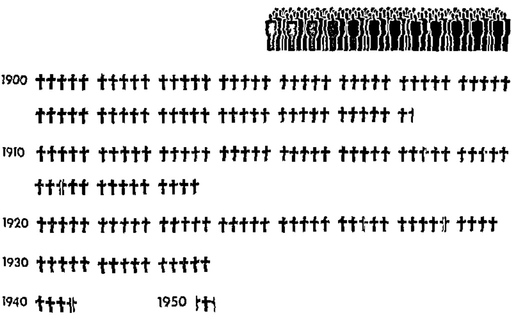
By the 1950's the life expectancy of an American baby at birth had risen to about 68½ years, a gain of nearly 20 years since 1900. The average rose because fewer people die in infancy and childhood. Maternal and child welfare work has helped to bring this about. The presence of more old people in the population has now focused attention on diseases that attack the middle-aged and the old—cancer, diabetes, mental disorders, afflictions of the heart, kidneys, and blood vessels.

Work of Local and State Health Departments

Local departments do the greatest share of public health work, since they are closest to the people. County units and the district units that serve two or more counties have increased greatly in number and in service to rural communities since 1930. The scope of the work of city health departments has also widened enormously in this period. Their sanitary officers test the water supply and check on sewage disposal (*see* Water Supply; Sewerage). They visit restaurants, packing houses, and other places where food is handled to find out whether the equipment is clean and the employees healthy. Department veterinarians test the cows from which the city milk supply comes and examine the milk and milk-handling equipment (*see* Dairying). Inspectors follow up complaints of insanitary housing conditions, and may order that substandard buildings be demolished. Engineers examine building plans to see that they meet with sanitary ordinances. Control of smoke, fumes, and odors; inspection of summer camps and swimming pools; heating, ventilation, and sanitation in factories; local programs for control of vermin—these are also among the tasks of city health officials.

How Science Is Conquering Disease

Infectious Diseases of Childhood in United States



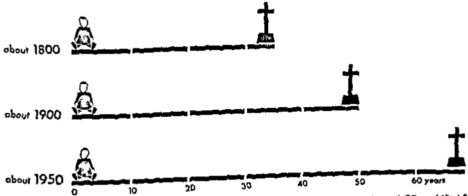
Each complete symbol represents 1 death per 100 000 *population*

blue from diphtheria black from whooping cough green from measles red from scarlet fever

Nowhere *has medical science* made greater gains than in its war against communicable diseases Public health work in immunizing
children has helped The great number of lives saved is suggested by the mass of *figures at top right* Notice that diphtheria
the chief killer in 1900, caused less than one death in 200 000 population (one half symbol) in 1950 The *toll from measles* was
the same and whooping cough killed about one in 100 000 Deaths from scarlet fever in 1950 were too few to be indicated

We Live Longer Than Our Forefathers

Prepared for Compton's Pictured Encyclopedia



The steady increase in life expectancy in the United States is revealed by this graph based on National Office of Vital Statistics
figures for the white population A white child born today may expect to live on the average more than 30 years longer than
one born in 1800 This gain is attributed largely to increased medical knowledge to health education, and to public health
measures for the prevention, treatment, and control of disease Lowered infant mortality is an important factor in the gain

The medical work of city health departments is carried on by a corps of physicians, nurses, and laboratory technicians. They investigate reports of acute communicable diseases and quarantine the homes where cases are found. They maintain hospitals for segregating patients when necessary. They operate laboratories for diagnosing infectious diseases and may supply serums for their treatment. One example of the work done by city health departments is the examination of dogs suspected of having rabies (hydrophobia). If the dog is found to be infected, it is killed and the department furnishes rabies serum to whatever persons the dog may have bitten.

Infant Welfare and School Activities

Child welfare activities may include clinics or conferences where mothers go for regular examination for themselves and their babies. Nurses instruct the mothers in the proper care of infants and visit them at home to see that the instructions are being followed. Vaccination against smallpox, inoculation against diphtheria, or other treatment may be given.

Health department nurses and physicians coöperate with the schools in examining pupils for physical defects or ailments, including bad teeth or poor eyesight, as well as in giving vaccinations, inoculations, and tests of immunity.

The bureau of vital statistics keeps a registry of births and deaths. The records showing the causes of death are valuable guides to future discoveries and improvements in the field of public health.

State health departments are responsible for enforcing the health laws of the state and they are usually empowered to issue whatever additional regulations may be needed to make the laws effective. They are active in education and research and they may do for the entire state any of the tasks described as part of local programs.

The inspection of food dealers and processors and the enforcement of pure food and drug laws are frequently the duties of the state department. Where water supply and sewage disposal involve regions beyond the jurisdiction of the city, the state department takes charge.

Many public health services are performed by branches of government other than health departments. A city department of streets may collect garbage. A state welfare or public charities department may maintain tuberculosis sanitariums. The Department of Labor may inspect factories to maintain hygienic working conditions. Examining boards may license physicians, dentists, druggists, and nurses.

The United States Public Health Service

Founded in 1798 to establish hospitals for merchant seamen, the work of the United States Public Health Service has expanded as new needs have arisen. Since the states could not defend their borders against disease from abroad, the Public Health Service was given the task of maintaining quarantine at ports of entry. Its officers examine immigrants and inspect passengers and crews of vessels, trains, busses, and airplanes arriving from foreign countries. They guard against rats and other disease-carrying vermin leaving from ships (*see* Rat). Reports from representatives in foreign countries give warning of epidemics that might be carried to the United States.

The Public Health Service supervises the manufacture and sale of biological products used in medicine to insure their purity and strength. Other medicines and drugs are regulated by the Food and Drug Administration, which like the Health Service is part of the Federal Security Agency (*see* Pure Food Laws).

The Service conducts research at the National Institute of Health and in field laboratories. Nutrition and methods of control of communicable diseases are among the problems it has investigated. It helps states and counties to establish and operate health services, and it makes nation-wide surveys of needs in health, sanitation, hospital facilities, and the like. It develops standard ordinances and sanitation codes.

The Service also operates hospitals for merchant seamen and for other persons for whom it is responsible, including drug addicts and lepers. It advises heads of federal departments and agencies in establishing preventive medical programs for federal employees, since a law making such programs possible was passed by Congress in 1946.

Mental Health and Vital Statistics Added

Other 1946 legislation extended United States Public Health work. The National Mental Health Act provided for an institute to conduct research in the causes, prevention, diagnosis, and treatment of mental and nervous diseases. It provides finances for research in this field by institutions and individuals, and aids in training psychiatric and other personnel to care for mental patients.

Vital statistics activities formerly handled by the Bureau of the Census were transferred to the National Office of Vital Statistics of the Service in 1946. It collects, analyzes, and publishes statistics on births, deaths, marriages, divorces, communicable diseases, and other data. It also publishes health information. In 1949 the Service set up a Radiological Health Unit to work out controls of hazards from radiation.

International and Private Health Agencies

In 1948 the United States joined the World Health Organization, an agency of the United Nations. Of the many health problems facing the WHO, it has given priority to action on malaria control, maternal and child health, tuberculosis, venereal disease, nutrition, and environmental sanitation. The WHO has headquarters in Geneva, Switzerland, and regional offices in various areas.

Privately supported agencies also carry on public health work. They include the Red Cross, the National Tuberculosis Association, the American Social Hygiene Association, the American Society for the Control of Cancer, the American Heart Association, the National Committee for Mental Hygiene, and the National Foundation for Infantile Paralysis. The Rockefeller Foundation and other philanthropic organizations devote themselves to health problems in many parts of the world (*see* Foundations and Charities).

The HEART—*A Living* PUMP *for* BLOOD

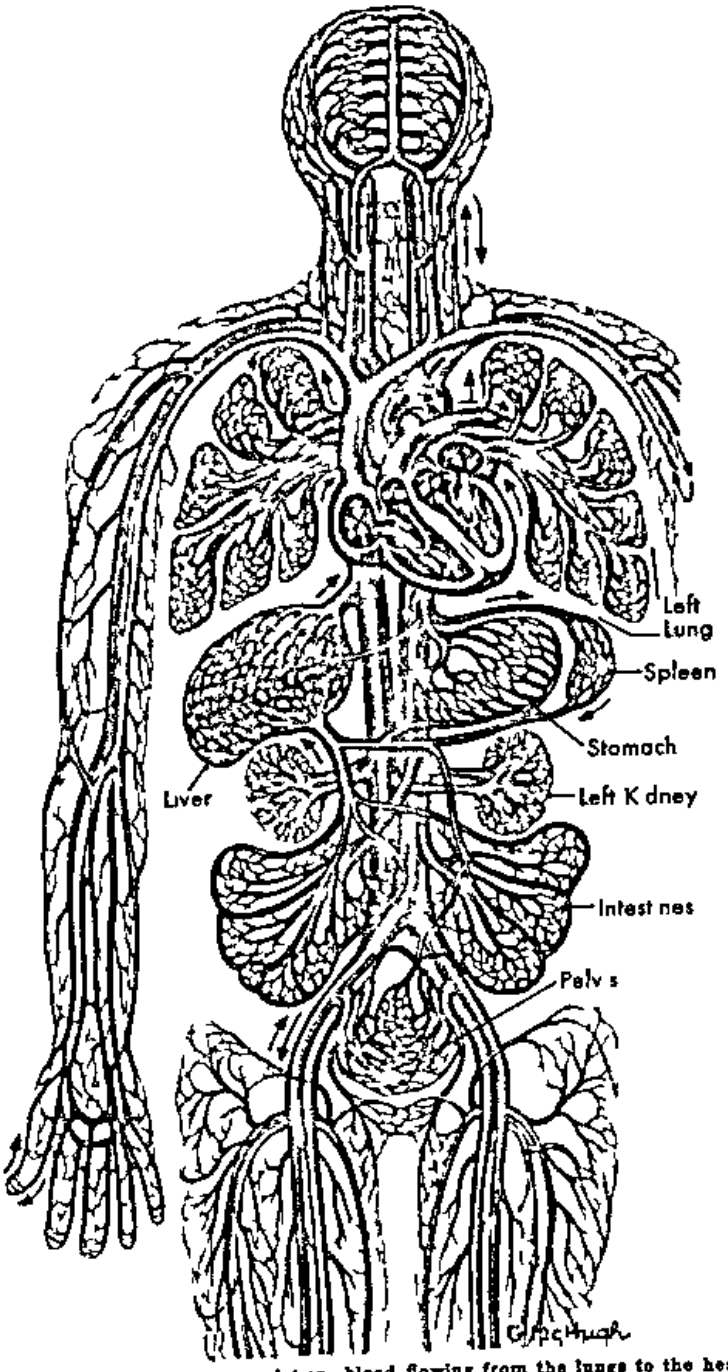
HEART AND CIRCULATION The human heart is the most wonderful pump in the world It keeps the blood moving through our bodies continuously during life It is no larger than a man s fist yet it pumps more than 4 quarts of blood to the body a minute It beats from two to three billion times in an average life It is automatic and can repair itself

This pumping goes on without stopping day or night as long as we live It must go on, because the body tissues cannot live without a constant supply of fresh blood The blood takes oxygen from the lungs to all the cells of the body and carries carbon dioxide from these cells to the lungs The blood delivers dissolved foodstuffs from the intestines to other parts of the body It carries wastes to the kidneys The blood carries substances that fight disease germs and others that regulate activities of the body's organs (*see* Blood)

Circulation of the Blood

The heart is located in the chest at the center of a network of tubes called *blood vessels* They carry blood from the heart to all the parts of the body and bring it back after it has served the tissues This movement of the blood between the heart and the tissues is called the *circulation* The heart and the blood vessels together form the *circulatory system* Vessels which carry blood from the heart are called *arteries* Those which carry blood to the heart are called *veins*

Blood containing a fresh supply of oxygen leaves the left side of the heart in a big arched vessel called the *aorta* This is the largest artery It sends branches to the heart itself to the head and to the arms Then it turns down behind the heart giving out branches to the internal organs Finally it divides into two arteries that carry blood to the legs and feet



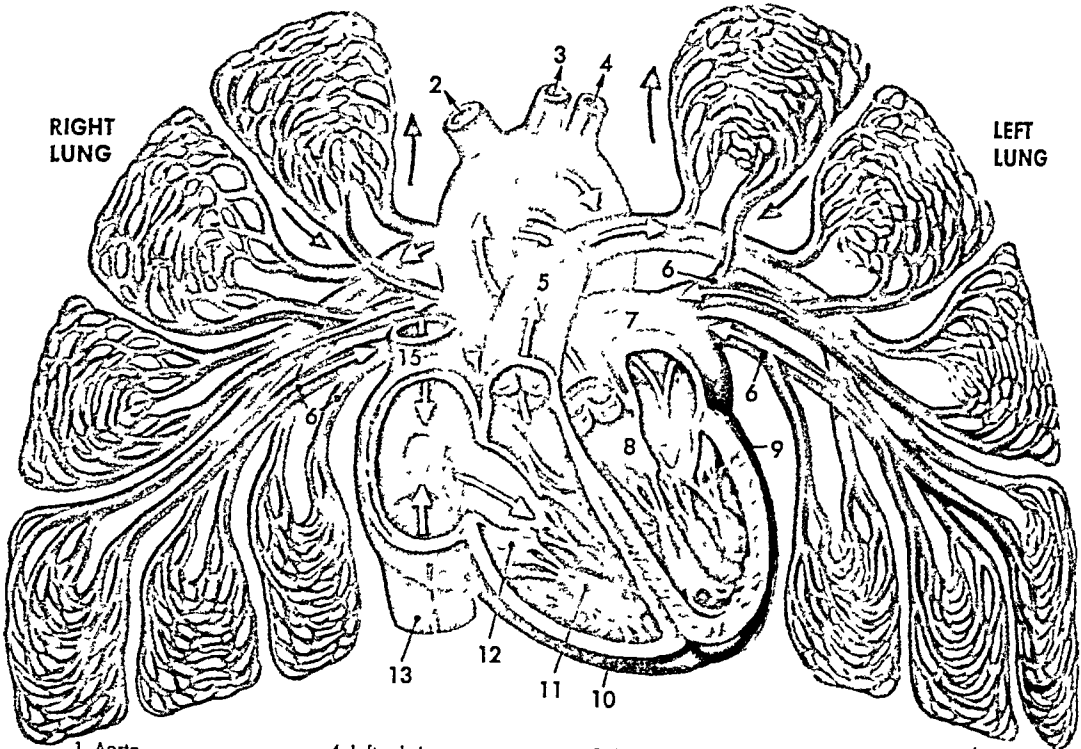
In this diagram of the circulation blood flowing from the lungs to the heart and then to the body is shown in red It has been freshly charged with oxygen Blue shows the blood flowing back to the heart and then to the lungs It has given most of its oxygen to the tissues Purple indicates portal circulation from the digestive organs through the portal vein to the liver It brings food materials for further changes and for storage until needed

Branches from the aorta divide into smaller arteries that reach the bones muscles and all the organs From the smallest arteries the blood flows into capillaries These are vessels so small they cannot be seen except through a microscope They branch to form a network throughout the tissues All exchange of materials between the blood and body cells takes place through the thin walls of the capillaries

At the end away from the arteries the capillaries unite to form small veins There the blood begins its return trip to the heart It has given up most of its oxygen and taken on carbon dioxide The veins unite again and again to form larger veins Finally the blood reaches the right side of the heart through two big veins the *superior* and *inferior vena cava*

Entrance of the blood into the right side of the heart completes its trip through the *systemic* (body) *circulation* Before starting out again the blood must get oxygen from the lungs It does this through

SENDING BLOOD THROUGH THE LUNGS TO GET OXYGEN



1 Aorta
2. Innominate artery
3 Left common carotid artery
4 Left subclavian artery
5 Pulmonary artery
6 Pulmonary vein
7 Left auricle
8 Bicuspid valve
9 Left ventricle
10 Right ventricle
11 Papillary muscle
12. Tricuspid valve
13 Inferior vena cava
14 Right auricle
15 Superior vena cava

The heart receives blood from the body (blue) in the right auricle (14), and sends it to the lungs. It comes back charged with oxygen (indicated by red) to the left auricle (7). The movement through the lungs is called the pulmonary circulation In the picture, the heart is relaxed and filling with blood. In a moment it will contract and the ventricles (9 and 10) will force blood out to the lungs and the body. To keep blood from entering the auricles, muscle extensions attached with cords to the cuspid valves (8 and 12) will hold them closed (Some parts of valves have been cut away, to give a good view into the heart.)

the *pulmonary circulation*. The blood leaves the right side of the heart in a pulmonary artery. This divides to go to each lung. In the lungs the blood exchanges carbon dioxide for oxygen through the walls of many capillaries. Then it flows to the left side of the heart in pulmonary veins. From there it starts out again to the body through the aorta.

Structure of the Heart

The heart is a hollow muscular organ with openings into the arteries and from the veins. In the diagrams of the circulation the heart is opened out to show how the blood passes through it.

The heart is about 3½ inches wide at its broadest part, 5 inches long, and 2½ inches thick. It is suspended in the chest cavity by the large blood vessels, with its base resting on the diaphragm. It extends farther to the left than to the right. A sac of fibrous tissue (not shown in the diagrams) encloses and protects the heart. Its name is *pericardium* (literally, "around the heart").

An interior wall divides the heart in half. Each half has a small upper chamber (*auricle* or *atrium*) and a large lower chamber (*ventricle*). On each side blood enters the auricle and passes through a one-way valve to the ventricle below. It passes from the ventricle through a one-way valve into the artery (pulmonary on the right, aorta on the left). The four-chamber arrangement lets blood with oxygen pass through the heart without mixing with blood from the body.

The valves between the auricles and ventricles consist of tiny triangular segments of tissue known as cusps. The one on the right has three cusps (*tricuspid valve*), and the one on the left two (*bicuspid valve*). The valves between the ventricles and arteries consist of three semicircular leaflets. These give them the name *semilunar* (half-moon) *valves*.

How the Heart Pumps

The heart pumps by alternately contracting and relaxing. Contraction begins at the top, in the auricles, and passes downward to the ventricles It is followed by an instant's rest. The diagrams on the next page illustrate this action and show how pressure forces the one-way valves to open and close

The walls of the auricles are thin. The walls of the ventricles are thick and powerful. The action of the heart tells us why. The ventricles have to pump blood out of the heart. The auricles only have to force it into the ventricles. The walls of the left ven-

tricle are thicker than those of the right This ventricle has to pump blood all through the body while the right ventricle sends it only to the lungs

Contraction or systole (*sĭs to-lē*) and relaxation or diastole (*dī-ăs tŏ-lē*) make the beat of the heart The average rate for adults during rest is 70 beats a minute but normal rates vary greatly

What Makes the Heart Beat?

The heart like other muscles works because it receives impulses from nerves The impulses that make it beat come from nerve cells and fibers which are complete in the heart with no outside connection Thus the heart is truly automatic

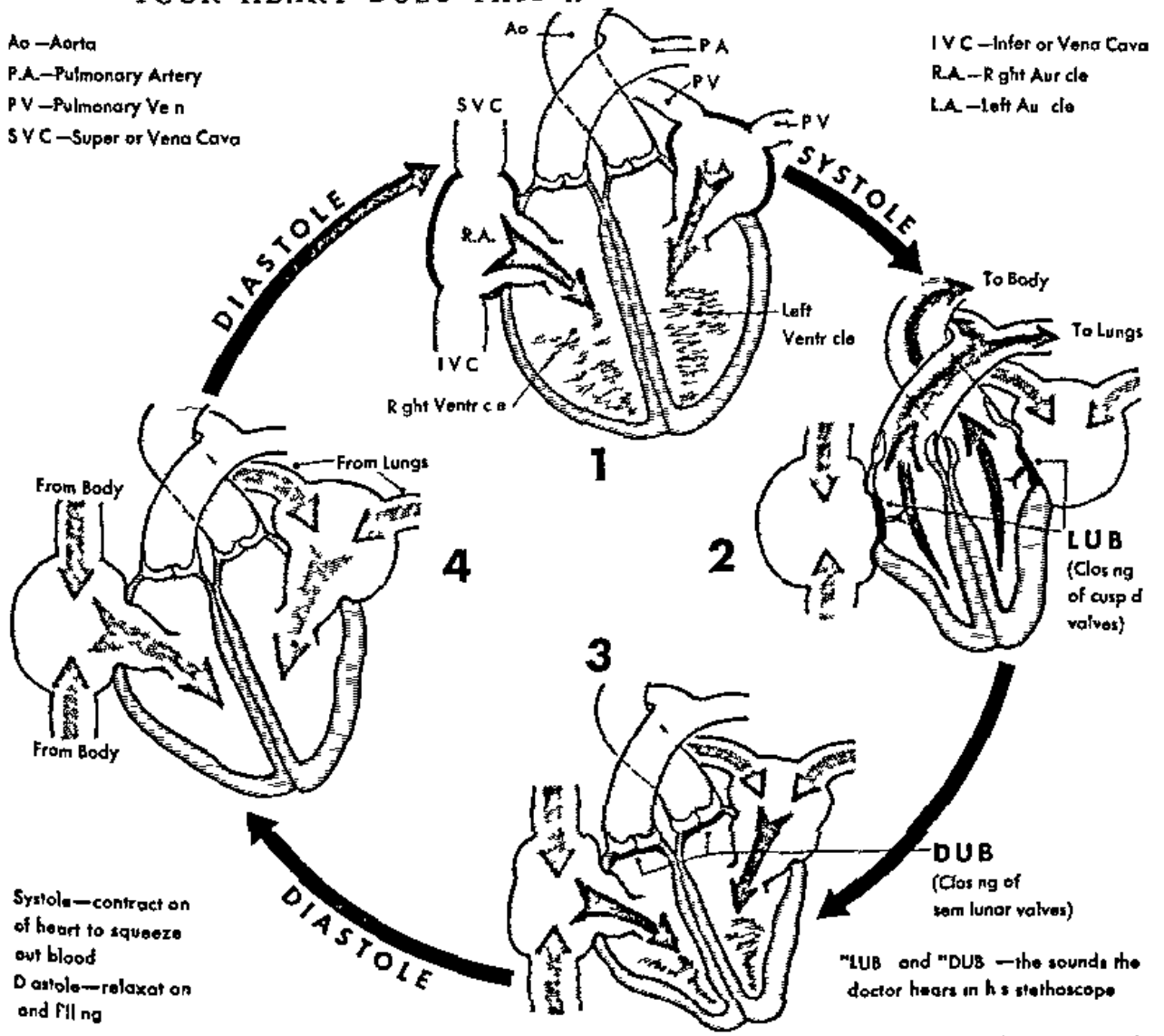
Impulses that regulate the *rate* of the heartbeat come through two pairs of nerves one from the spinal cord (the accelerators) and one from the medulla (the inhibitors or brakes) Through nerve centers where they originate these nerves receive impulses from other parts of the body and pass them along to the heart Fear for example slows down the heart Excitement and exercise both make it beat faster

How Arteries and Veins Help the Heart

Arteries have thick elastic walls Blood enters the aorta in spurts from the left ventricle The walls of the aorta bulge with each spurt and recoil or contract behind it This motion sends the blood forward in waves adding force to that supplied by the heart The wavelike flow continues through all the arteries It accounts for the beat of the pulse

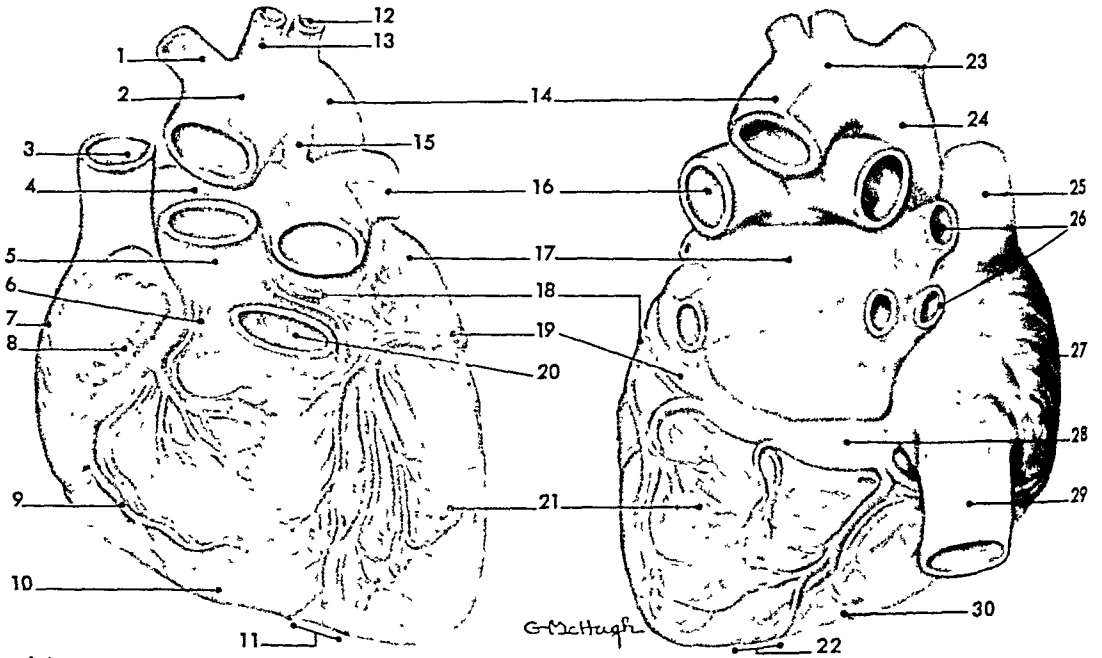
By the time the blood reaches the capillaries the spurting motion has spent itself The blood flows slowly through these microscopic vessels It gathers

YOUR HEART DOES THIS ABOUT 70 TIMES A MINUTE



This series of diagrams shows how the heart pumps 1 The auricles contract squeezing as much blood into the ventricles as they will hold 2 The ventricles contract Pressure of blood inside them forces the cuspid valves (which open inward from the auricles) to close and the semilunar valves (which open outward into the arteries) to open Blood spurts into the arteries 3 The ventricles relax and pressure in them falls Pressure of the blood just pumped into the arteries closes the semilunar valves Pressure of blood in the auricles opens the cuspid valves and blood flows into the ventricles 4 Blood continues to flow into the auricles and on into the ventricles as the entire heart is relaxed and rests briefly Then contraction starts again

THE HEART JUST BEFORE IT BEGINS TO CONTRACT



1. Innominate artery
2. Aortic arch of the aorta (5); a portion is cut away to show the vein behind
3. Superior vena cava
4. Right branch of pulmonary artery
5. Ascending aorta
6. Right coronary artery
7. Right atrium
8. Right auricle
9. Anterior cardiac vein
10. Right ventricle
11. Anterior longitudinal sulcus, also, location of septum between ventricles
12. Left subclavian artery
13. Left common carotid artery
14. Descending aorta
15. Arterial ligament (before birth, the arterial duct)
16. Left branch of pulmonary artery
17. Left atrium
18. Left coronary artery
19. Great cardiac vein
20. Pulmonary artery
21. Left ventricle
22. Posterior longitudinal sulcus
23. Aortic arch
24. Ascending aorta
25. Superior vena cava
26. Pulmonary veins from right lung
27. Right auricle
28. Coronary sinus emptying in right auricle
29. Inferior vena cava
30. Right ventricle

These drawings show the heart from the front (left) and the back (right). The auricles are full and ready to contract. Note that anatomically the auricle actually is a flaplike pouch at the top of the atrium. It has become customary, however, to call the entire chamber the auricle. As these pictures show, the main blood vessels are very large. The coronary arteries on the surface of the heart send branches throughout the heart muscle. The heart receives its nourishment through capillaries that connect these branches with the cardiac veins. The latter return the blood to the right auricle.

speed as several capillaries empty into each vein. The veins are relatively larger than the arteries, with thinner walls. Pressure from any kind of movement squeezes them, forcing the blood to flow faster. Veins contain one-way valves at frequent intervals to keep the blood from flowing backward.

The Electrocardiogram

The heart develops electric charges as it beats, because, like all muscle, it is electrically negative in its contracting portion and electrically positive in its relaxed portion. This current can be registered from the exterior of the body.

The electrocardiograph is an instrument for recording the current generated by the heart. It makes a tracing known as an electrocardiogram. This shows the beat of the heart as a series of up-and-down waves. It helps doctors detect irregularities in the heartbeat which may indicate disease.

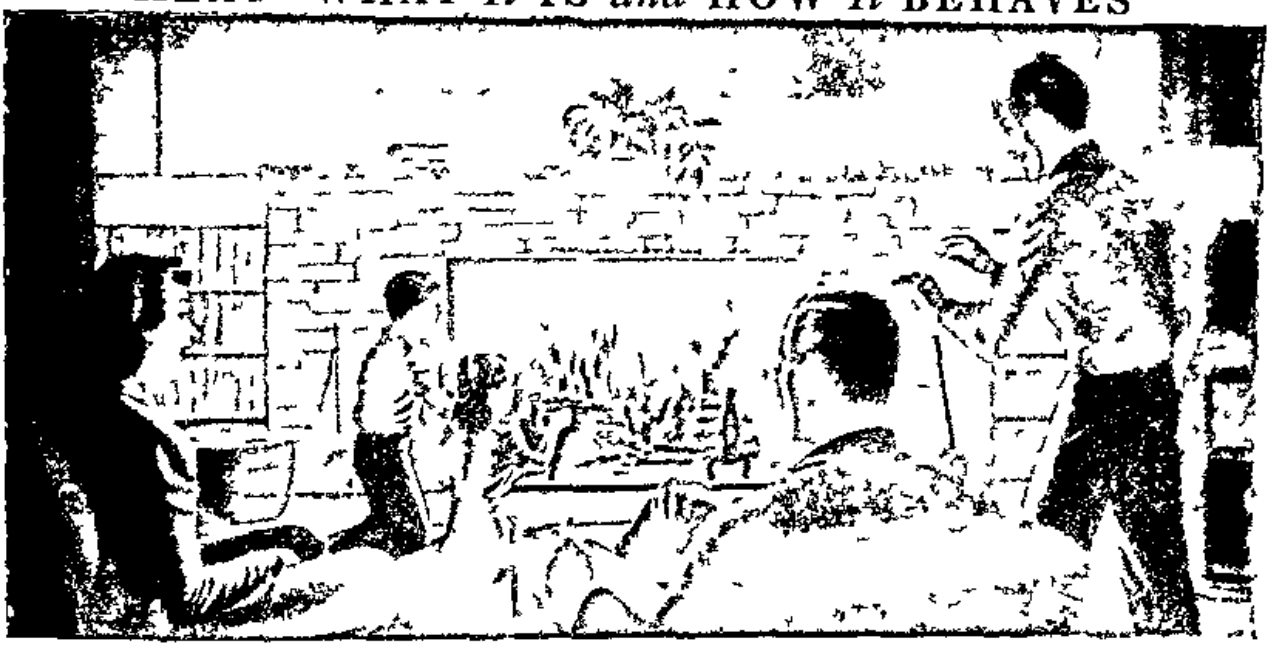
The Heart May Get Out of Order

The chief cause of heart trouble in young people is rheumatic fever, in which infection may destroy tissue in the valves or heart muscle. Among older people, the leading causes are high blood pressure and hardening of the arteries. These conditions force the heart to beat against pressure. In hardening, the coronary arteries, which supply the heart, are affected. Narrowing or a blood clot (thrombosis) may then deprive the heart muscle of necessary oxygen.

The heart has wonderful powers of recovery against disease. It may enlarge to overcome the handicap of leaking valves or an increase in blood pressure. It can repair itself by replacing diseased tissue with scar tissue, and work almost as well as ever.

The rules for care of the heart are the rules for healthy living. A balanced diet supplies the heart muscles with necessary food elements. Moderate exercise tends to keep it in good condition. Excesses of eating or exercising and emotional upsets put an extra burden on it. Sufficient rest and sleep are necessary to give the heart periods free from strain. Excessive worry not only disturbs the heart rate and raises the blood pressure but interferes with rest.

HEAT—WHAT *It* IS *and* HOW *It* BEHAVES



A Cheerful Fire Proves the Value of Heat to All Living Beings

HEAT All living things must keep warm in order to stay alive During the summer plants and animals profit from the warmth Plants grow rapidly, and produce fruit and seed Animals get fat, and their young ones grow rapidly Human beings grow crops and enjoy life out of doors

When winter comes living things must take special measures to stay alive Many plants just die, leaving seeds for the next year Others shed their leaves and become dormant Animals have many ways of getting through the cold months Human beings wear warm clothes and heat their buildings

These differences between summer and winter living show the great importance of heat for supporting natural life Heat also provides much that men need for living in modern ways Fire in boilers produces steam for running engines and generating electricity This power runs railroads, factories and ships Heat from burning coal and oil keeps buildings warm in winter *Heat is used to smelt metals and is used to* help make numerous other products

Heat can destroy as well as support life Fires cause immense damage and kill and injure many living things every year Too much summer sun can cause sunstroke and give painful sunburn

Principal Sources of Heat

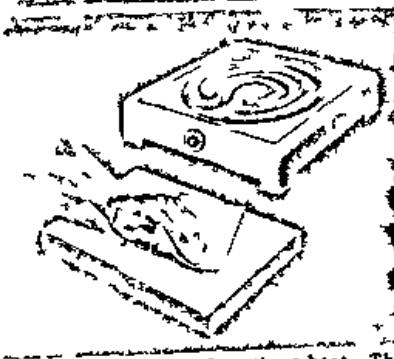
Where do living things get this valuable, life-supporting heat? The principal source is the sun Without heat from the sun the temperature would be hundreds of degrees below zero The sun a heat makes winds and rain

The sun also provided all our common fuels Coal and petroleum came from the buried remains of plants and animals that once lived with heat from the sun These fuels give men their commonest way of

SOURCES OF HEAT



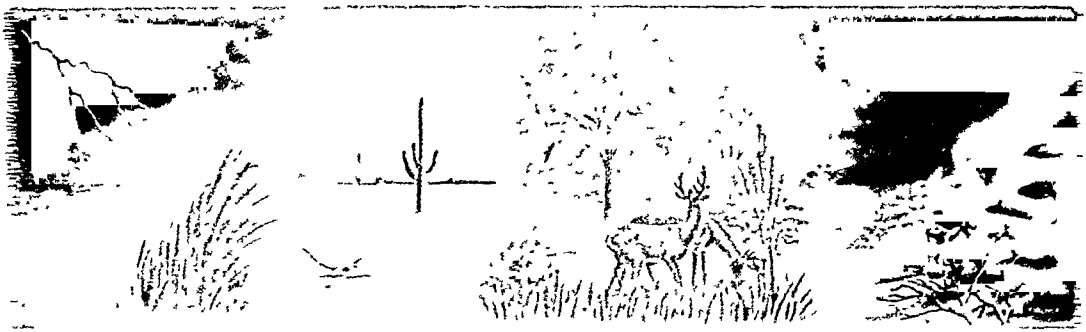






Summer fields are green and the earth is warm *because the sun* gives them heat The sun also has provided fuel for giving heat by burning Fire is one form of chemical action Many other forms also give heat Heat can be generated by friction such as comes from sandpapering a board Sending electric current through a wire will give heat Still another source is atomic energy

SOME OF THE WORK HEAT DOES IN NATURE



The sun's heat draws water into the air and also causes winds. In many places, storms release water as rain or snow. In others, the sun dries the land into a desert. Where rainfall and the sun's heat are sufficient, green plants thrive and provide food for many animals. Other animals prey upon the plant eaters. When the sun's heat lessens in winter, men must build fires to keep warm.

getting additional heat—that is, by *burning* something in a fire. Burning is a form of *chemical action.* It unites oxygen from the air with carbon from the fuel, and the union gives off heat. Many other chemical actions give heat. When a bricklayer mixes lime and water as part of his mortar, the mixture becomes very warm. Chemical action within explosives releases tremendous heat as well as force.

Another means of getting heat is by *friction.* Primitive peoples in all ages have started fires by rubbing sticks together in one way or another. American colonists struck flint against steel to produce a spark by friction. Today, when we strike a match, friction generates enough heat to set the sensitive chemicals in the tip afire.

We can also produce heat with *electricity.* Passing enough current through a wire makes it red hot. Electric toasters, heaters, and irons work on this principle.

Atomic energy is another source of heat. The reactors ("piles") which produce material for atomic bombs can generate power to drive trains and automobiles and heat enough to provide electricity for a city. The first reactors were not designed to generate heat and power for ordinary uses; but engineers are making progress in designing apparatus which will give satisfactory commercial service.

What Is Heat?

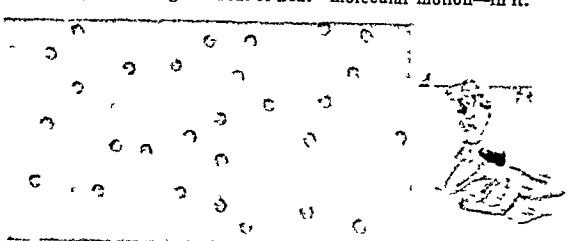
It may seem strange that these vastly different sources can all give the same thing, heat. But it is not hard to find something that is the same in all of them; and it is this "something" that gives us heat.

What can be the same in things as different as the sun, a rubbed stick, a hot wire, and the material in an atomic reactor? It is this: each object is made of *matter.* But all these sources of heat are made up of different kinds of matter, and each kind is in a vastly different state. Therefore, whatever gives us heat must be the one thing that is present in all matter. The one thing that is common to every kind of matter is that it is made of *molecules*—particles so small that billions and billions of them can be found in the point of a pin. (For a picture, *see* Atoms.)

HEAT IS REALLY MOTION



All matter is made up of tiny moving bits called molecules. At any ordinary temperature they are moving at terrific speed, and it is their motion that we feel as heat. Though we think of winter air as "cold," it has a great deal of heat—molecular motion—in it.

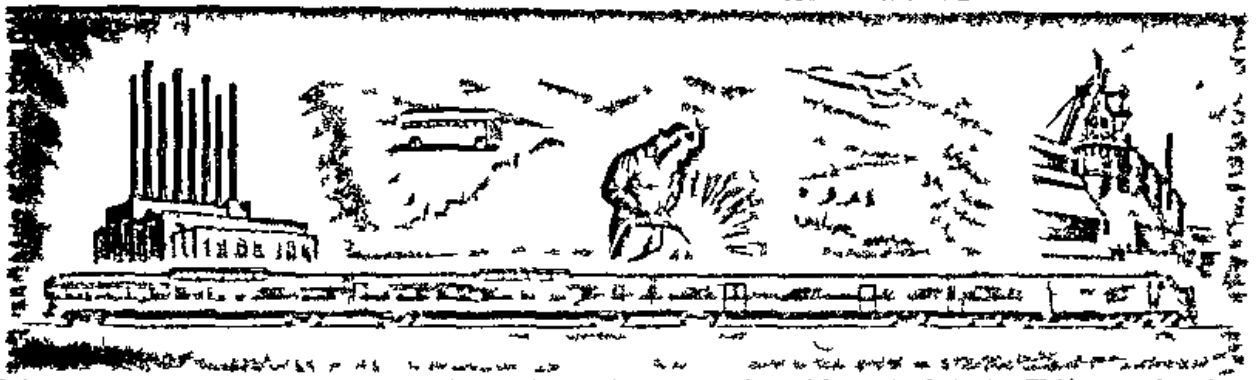


In summer the motion of air molecules is much more furious than it is in winter. They jostle and bump one another many more times a second than they do when air is cold. These collisions spread the molecules out, making warm air thinner and lighter than cold air.

These molecules are always moving and hitting each other. In a piece of solid matter such as a stick of wood or a wire, the molecules stay in place and move by vibrating. In a liquid such as water they roll and tumble about each other, like grains of sand pouring down a chute. In a gas they fly about freely in space, like so many bullets shooting here and there. But in every case they are in motion; and it is this motion of the molecules which is the source of heat. Scientists go even further in explaining heat. They say that heat is nothing more or less than *energy given by motion*—the average amount of motion in the molecules of a substance. (The energy is called *kinetic,* from a Greek term meaning "moving.")

Our own bodies can show what this means. They are made of molecules, and at any time the molecules have a certain average energy of motion. If this average is "just right," we feel "right"—neither too hot nor too cold. If the molecules go faster than usual,

HEAT WORKS FOR US IN MANY WAYS



Industry and transpo tation use heat in va ed ways Power plants turn coal or o l heat into electr c ty Welders use heat f om acetylene gas or an electr c arc Sme t ng plants generate t emendous heat to extract metal f om crude o e The eng ne of a bus the power un t of a jet p ane and the locomo ve of a s eek streaml ne all get their power from o l heat

we feel hot If they go slower we feel cold So it is with everything in the universe from the blazing sun to the ice at the North Pole Heat depends upon the average energy of motion in the molecules of any substance we consider

Temperature and the Amount of Heat

When we use a thermometer we measure the *temperature* of a substance This means that we are measuring the *average energy of motion* in the molecules of the substance This energy depends upon two things the mass of the molecules and their average speed Mass remains the same no matter what the heat so changes in temperature must be caused by changes in average speed The average is what counts because each individual molecule changes its speed constantly as it bumps into others and bounces away

This shows that temperature is not the same as the *quantity* of heat in a substance Quantity depends upon the number of molecules and their mass as well as their speed It takes more energy to get heavy molecules going faster than it does lighter ones —or to get *more* molecules going faster A burning match and a log fire may have the same temperature but the log fire has a much greater quantity of heat

The Meaning of Cold

From the nature of heat it is easy to see what is meant by cold To be completely cold a substance must have its molecules completely at rest Scientists say that in outer space between the stars the sun and its planets matter is in about this condition The temperature there is hundreds of degrees below zero Anything that has higher temperature—and this means every familiar thing—has some motion in its molecules and has some heat

What we usually mean by hot or cold is this The substance we are considering has a higher or lower temperature than our bodies have On a summer day we get used to the temperature of the air In comparison ice water seems cold But if our hands are chilled on a winter day ice water may feel warm

How Substances Get Hot or Cold

Heat travels from hotter objects to colder ones A pan ful of cold water on a fire soon warms up If you go near a fire after being chilled in winter you soon feel warmer

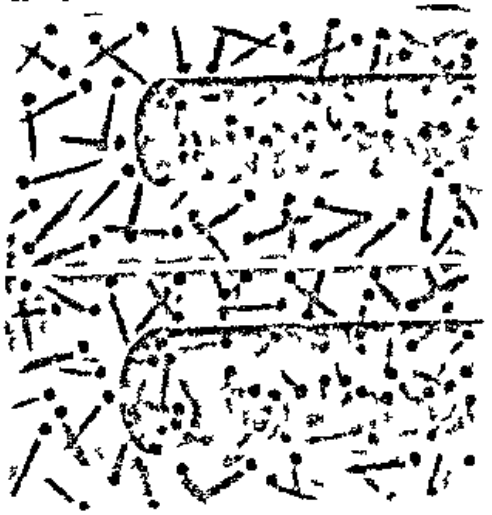
The nature of heat as energy of motion explains these changes The faster moving molecules in the hotter object strike those in the colder one and speed them up As this happens the colder object gains heat that is greater energy of motion in its molecules When the energy is the same in each substance the transfer stops

One substance can cool another by the same process The transfer of heat runs the same way—from the warmer object to the cooler one But the warmer one has given up some of its energy of motion in other words it has been cooled

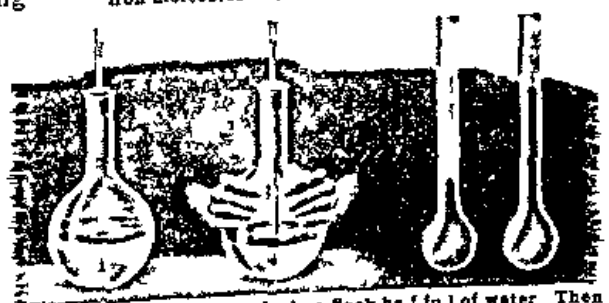
Heat Expands Matter

The nature of heat also explains why substances

HEAT MAKES THINGS EXPAND

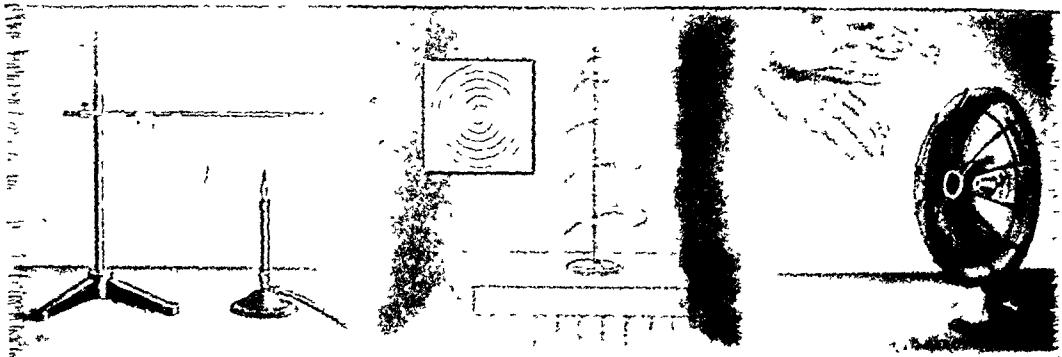


A cold iron rod is surrounded by warmer air top Bottom the faster mov ng a r molecules speed up the iron molecules and make the rod *expand*



Place a stopper and glass tube in a *flask ha f fu l* of water Then warm the a r above the wa er w th your hands The air w ll expand and force water up the tube The thermometer (right) uses this p inciple to measure temperature

HOW HEAT TRAVELS FROM PLACE TO PLACE



Heat moves in three ways. Stuck bits of wax to a metal rod and heat it at one end (left). *Conduction* will carry heat along the rod, and the pieces of wax will drop off one by one. Cut a spiral from stiff paper and support it over a radiator (center). *Convection* currents will make it whirl. *Radiation* carries energy through empty space. An electric heater (right) is a common example.

expand when they are heated. For a simple example imagine a crowd of people packed closely together. Then imagine the people getting restless and elbowing each other. They will push apart, and the crowd takes up more space. It has *expanded*.

This is very much like what happens when a substance is heated. Its molecules get more energy of motion and as they collide they push each other farther apart. This makes the substance expand.

Gases expand the most when any given amount of heat is added. Liquids expand less, solids least of all. It is easy to prove that solids do expand as they gain heat. Lay a nail flat and adjust a pair of calipers to its ends. Then heat the nail and try the calipers again. They will not fit over the ends. The nail has lengthened because the metal expanded.

Conduction of Heat

Heating a nail in a fire illustrates a common method of heat transfer called *conduction*. Conduction occurs whenever a hotter substance is in contact with a cooler one. The more energetic molecules of the hotter substance transfer energy to the others.

Heat also passes along or through an object by conduction when some one part is heated. But substances vary in the rate at which they conduct heat. This can be proved with a glass rod and an iron rod. Hold each by one end and place the other ends in a flame. The iron rod will become hot to the touch while the glass rod is still cool.

Substances that conduct heat easily are called *conductors*. Those that do so poorly are *insulators*. Metals are the best conductors because their molecules are closely packed, and motion is quickly transferred from one molecule to the next. Silver is the best conductor, copper is next, and aluminum is third. Liquids are poor conductors, and gases are poorest of all.

Transfer of Heat by Convection

Heat can also be transmitted from one place to another by the movement of a heated gas or liquid. This kind of heat transfer is called *convection*.

Most systems for heating houses use convection. A radiator heats a whole room even though it is not touching any object in the room. Air heated by the radiator flows to other parts of the room and there transfers part of its heat to cooler objects. Such a flow is called a *convection current*. Heat sets up convection currents in liquids also. These may be seen in a pan of water heating on a stove. The water rises over the hottest part of the pan, flows to the cooler edge, and goes down.

Heating by Radiation

A third method of heat transfer is called *radiation*. It carries heat across empty space, such as the space which lies between the sun and the earth. It will also transfer heat through air-filled space.

The article on Radiation explains how energy travels across space in a wave form. The transfer is the same as that which carries light, except that the frequency (number of vibrations a second) is less. Since this frequency is only slightly smaller than the frequency which carries red light, this type of heat transfer is often called *infrared* (meaning "below the red") *radiation*. Another name is *infrared rays*.

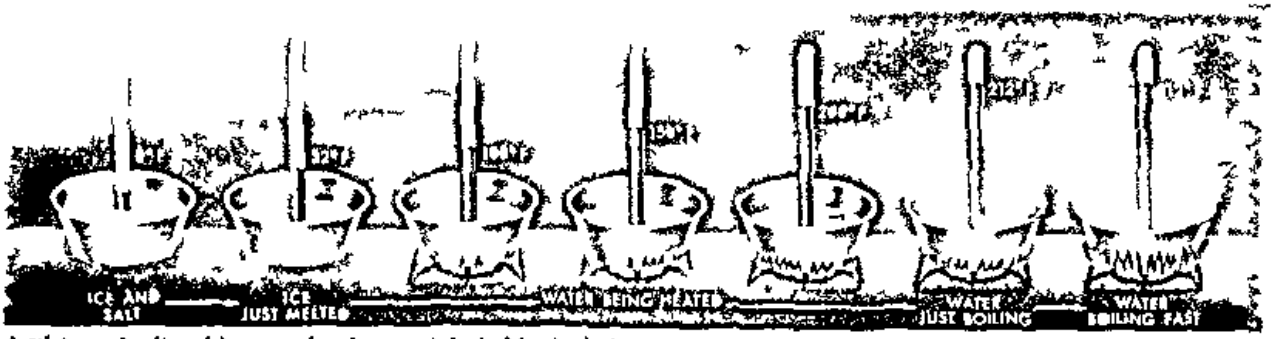
Every hot object, from the sun to a flatiron, generates infrared radiation according to its amount of heat. The radiation moves at the speed of light (186,000 miles a second). This swift action explains why an electric heater gives heat so quickly. It sends infrared radiation into a space instantly. It does not have to heat the air by conduction or convection.

When the radiation strikes a dark object it is absorbed, and the energy makes the molecules move faster. Light-colored objects tend to reflect infrared radiation rather than absorb it. This is why white clothes are cooler in summer than dark ones. Shiny surfaces also reflect infrared radiation. That is why polished metal is used behind the heating element (hot wire) of an electric heater.

How Heat Is Measured

For many hundreds of years, civilized men had no way of measuring temperature accurately. Modern thermometers were not developed until the 17th century. Thermometers are marked according to either of two standard scales, the *Fahrenheit* and the *centigrade*, or *Celsius*. The differences between the two are explained in the article on Thermometer.

HOW WATER BEHAVES AT DIFFERENT TEMPERATURES



A mixture of salt and ice can absorb a great deal of heat A thermometer set in such a mixture will read 0° Fahrenheit In placing ice it will read only 32° As water is heated its temperature rises to 212 Then it boils—that is it turns into a gas which we call steam Further heating will not raise the temperature The water simply boils faster

Scientists also use a scale devised by Lord Kelvin He and other physicists computed the temperature a substance would have if its molecules had no motion This temperature is called *absolute zero* Today it is computed as 459 69° below zero Fahrenheit (−273 16° centigrade) The *Kelvin scale* uses centigrade degrees starting from absolute zero

The *quantity* of heat in a substance is computed from the temperature changes that occur when it is heated Scientists commonly use a unit of heat called the *calorie* or *gram calorie* This is the amount of heat necessary to raise one gram of water one degree centigrade (The calorie used by dieticians however is the *kilogram calorie* 1 000 times as large) In physics the official unit is the *joule* (239 calories) Engineers however use the *British thermal unit* (B T U) the heat required to raise one pound of water one degree Fahrenheit A wooden kitchen match burned completely releases almost exactly one B T U The heat-giving value of fuels is stated in B T U s

Specific Heat

All materials cannot soak up heat at the same rate One B T U will warm one pound of water one degree Fahrenheit But it will warm a pound of lead 30 degrees

The heat in a substance depends partly on its *mass*—the number of molecules in it and their weight It also depends upon the kind of substance Substances vary in their capacities for taking up heat This capacity is called the *specific heat* of a substance It is equal to the number of calories needed to raise one gram of the substance one degree centigrade Water has a specific heat of 1 00 and serves as a standard for all specific heats

Heats of Fusion and Vaporization

Substances also change their state when they are heated or chilled When water is cooled to 32°F it freezes to a solid (ice) If heated to 212°F it becomes a gas (steam) All simple substances change their state at certain temperatures

Both the freezing point and the melting point of water are 32°F It might seem impossible that a substance can take *either* solid or liquid form at this point but this is so Suppose a pound of ice is heated from 0°F to 32°F When it reaches this temperature nothing happens The ice remains firm and solid even though 32°F is the melting point

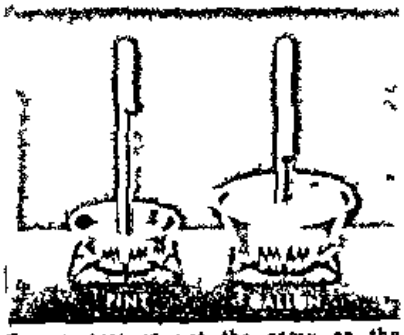
The reason is simple The molecules in a piece of ice are rigidly bound together in a crystal pattern After the temperature reaches 32° a great deal more heat (144 B T U s) must be added to break down the ice crystal into water When water freezes exactly the reverse happens The water reaches a temperature of 32°—then it gives off 144 B T U s more a pound before the molecules slow down and join into ice crystals

The extra quantity of heat required to make water or any other substance change its state between solid and liquid is called the *heat of fusion* Different substances have different heats of fusion When a substance boils there is a similar situation After water reaches 212°F it must get a great deal more heat before it changes to steam For a pound of water this amounts to 970 B T U s This additional heat is called the heat of *vaporization* of a substance To change a substance from a gas back to a liquid the same amount of heat must be taken away

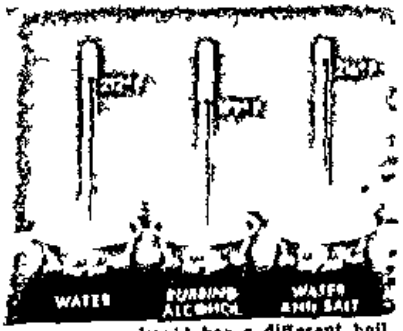
Variations in Boiling

A liquid reaches its standard boiling point under simple conditions—with pure liquid in open vessels and at sea level atmospheric pressure The boiling temperature be-

AMOUNT OF HEAT



Temperature is not the same as the *amount* of heat in a substance Heating a pint and a gallon of water over a burner shows this Each quantity gets the same amount of heat but the temperature goes up faster in the *smaller amount*



Almost every liquid has a different boiling point—the temperature at which it turns to a gas Pan water rubbing alcohol and salt water boil at the temperatures shown here But extra heat must be added after the temperature is first reached before boiling starts

comes high if a solid such as salt is dissolved in the liquid. Gas dissolved in it lowers the boiling point. The boiling point also changes when surrounding air pressure is altered. High pressure, as in a steam cooker, raises the boiling point considerably. Under low atmospheric pressure, as on a mountaintop, a liquid boils at relatively low temperature.

This happens because boiling depends on the balance between the forces within the liquid and those in the space above it. At any temperature, some molecules tend to escape from a liquid into the air. Even at low temperature, they exert a measurable pressure. When the liquid is heated, their ability to escape increases and the pressure rises. When this pressure is greater than the pressure of the atmosphere, the liquid boils. Obviously, then, the higher the atmospheric pressure, the higher the boiling point, and the lower the pressure, the lower the boiling point.

When water is heated in a closed vessel, the pressure above the water is greatly increased, and so the boiling point is raised. Water raised to high temperature under pressure but not yet boiling is said to be *superheated*. When water does boil under such conditions, the steam given off is superheated also. Superheated steam is used in most steam engines because it is "dry"; that is, it does not tend to condense on the cylinder walls.

The converse of superheating is *supercooling*. When a liquid is cooled at reduced pressure, it will not freeze at its ordinary freezing point but will remain liquid. The same thing will happen to water at ordinary pressures if it is cooled very slowly and carefully. Its temperature can be reduced far below 32°F., and it will not form ice. But once it is supercooled, a sharp rap on the vessel or a tiny crystal of ice dropped into it will cause it to freeze instantly.

Early Theories about Heat

The wonders of heat have always fascinated men. Primitive people have usually thought that heat was a gift from the gods. In the 17th century, scientists developed a curious theory about heat. They thought that when something burned, a hot invisible substance they called *phlogiston* escaped from it. But toward the end of the 18th century, the French chemist Antoine Lavoisier proved that this could not be so. He showed that metals weighed *more* after being burned than they weighed before. This happened, he proved, because when it burned, the metal combined with oxygen from the air.

But Lavoisier did not explain the nature of heat itself. Scientists generally thought of it as a weightless invisible fluid which flowed from one object to another. They called the fluid *caloric*. This theory was discarded when Count Rumford, a brilliant physicist, proved that heat resulted from motion. He knew that the brass blank for a heavy gun barrel grew very hot when it was bored. He repeated this operation many times under conditions which seemed to prevent any flow of "caloric" into the blank. Each time, heat was generated. Therefore the heat could come only from friction.

Sir Humphry Davy proposed that the energy of friction made the molecules of a substance move faster. In 1840, James Prescott Joule showed that a definite amount of work (energy) always produced a certain definite amount of heat. Since that time, Davy's theory of heat has been generally accepted.

HEATHER. The songs and stories of Scotland are filled with praises of the "bonnie blooming heather." It covers the rugged Highlands with a cloak of purple and mingles its delicate fragrance with the upland air. The heather enters into the life of the people as perhaps no other plant has done in any land.

The heather—or "ling," as it is sometimes called—is found not only in Scotland, but also throughout northern and western Europe. It is a small evergreen shrub, sometimes rising only a few inches above the ground, but often growing to a height of three feet or more. On its purplish brown stems are close-leaved green shoots and feathery spikes of tiny bell-shaped flowers, usually rose-lilac in color, but ranging from deep purple to pure white. White heather, which is somewhat rare, is the most prized of all. In Scottish superstition this plant is thought to bring good luck.

THE HEATHER OF SCOTLAND



The tiny, delicate bells of the common heather cast a purple mist over the Highlands in autumn.

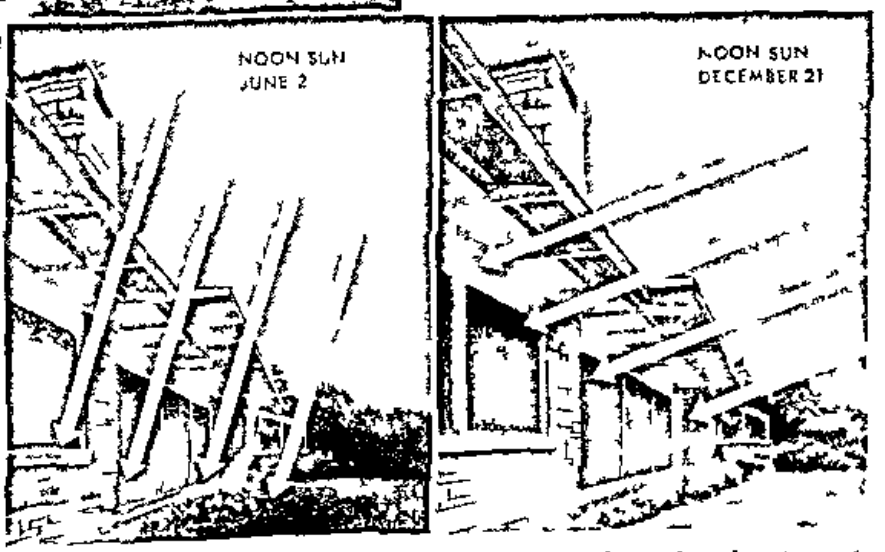
Not only does the hardy heather lend beauty to the landscape, but it serves many useful purposes. The tops afford winter forage for Highland sheep and cattle. The flower is a favorite of the bee, and heather honey has a delicious flavor. The larger stems are made into brooms, the smaller into brushes. Owing to the scarcity of wood, the Highlanders in former times built cabins, or "shielings," of heather stems cemented with mud, and the same plant served to thatch the roofs. Heather laid on the ground with the small twigs uppermost formed a comfortable bed for the old warriors, as it still does for shepherds and hunters.

The common heather (*Calluna vulgaris*) belongs to the family of plants called heaths (*Ericaceae*), from the fact that they grow on open tracts of poor and uncultivated land. There are more than 400 species, the greater number being found in South Africa. Some of these species have flowers of large size and brilliant color. Other varieties grow in the Mediterranean region in Europe, and one of these (*Erica scoparia*) is used in making the so-called "briarwood" pipes. Heather like that of Scotland has been found in the eastern part of North America, but many scientists think it was introduced by early settlers. African species are sometimes cultivated as a garden or hothouse plant.

INDOOR COMFORT *with Modern* HEATING



s beaut ful solar house captures e sun s heat on w nter days The oad eaves protect t from summer n The p ctures at the r ght show w the sun s rays enter the w ndow winter, but are blocked in summer



EATING AND VENTILAT NG A fireplace with ackling logs blazing on the arth is an inviting scene in nter But it is a very poor ating device Stoves are more ficient but a stove only heats e room (*see* Stoves and replaces) It is far better herever winters are severe ough to require steady armth to heat a building om a central heating plant hus the heat is distributed throughout the spaces ithin the build ng an l warms each one evenly

In large buildings especially auditoriums a heat- g system may be linked to a fresh air supply This rings comfort from circulating air in add t on to istributing the heat Air circulation systems also ork well in the summer and may be part of *a complete* ir-conditioning system (*see* Air Conditioning) Ven lation may come simply *through open* windows or through elaborate systems of blower or exhaust fans and ducts

How Rooms Are Heated

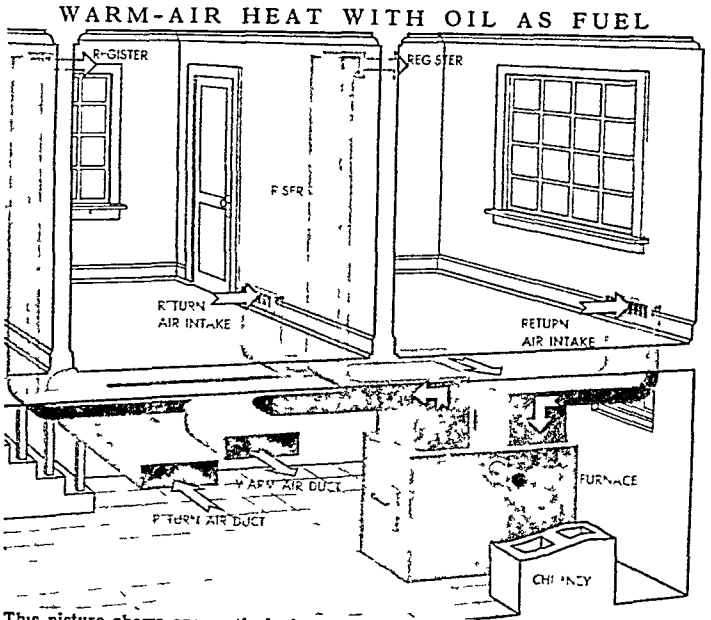
Heating systems vary greatly in detail but most of them begin by burning fuel in a furnace located in a basement Where inexpensive current is available electricity may be used in place of a com bustible fuel Heat is then carried to the rooms by warm air hot water or steam These heat-carrying mediums or fluids travel by pipes or ducts to heat distributors in the rooms

Once in the room the heat warms by *radiation convection* or *conduction* (*see* Heat) Usually a combination of these processes takes place at the same time Warm air heats by convection until the walls floor ceiling and objects in the room itself are warm The room *and its objects also gain and lose heat* by radiation among themselves Hot water or steam conducts heat to the wall surfaces of the heat-distributing unit and the surfaces radiate heat to the room Air currents flowing past the units are warmed by convection and conduction

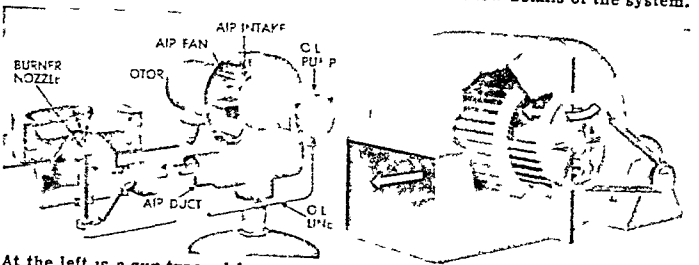
Warm air systems are especially suitable for smaller houses Cost of instal lat on is usually lower than hot water or steam Hot-water systems have the advantage of delivering a controlled amount of heat Steam heat is best in larger buildings where greater quantities of heat are neede l Steam can circulate freely through a tall building and usually requires smaller pipes and distributing units than hot water

Furnaces and Boilers

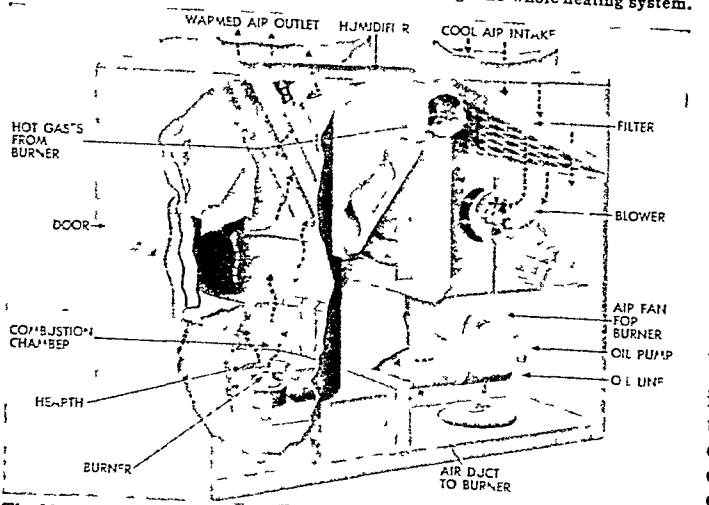
The warm air furnace consists of two basic parts a combustion chamber or fire pot in which the fuel



This picture shows one method of arranging warm-air ducts in first-floor rooms and basement In the rooms, supply ducts end in registers high on the walls The return registers and ducts are low The pictures below show details of the system.



At the left is a gun type oil burner. The paddle-bladed fan supplies air for burning through the large duct and compressed air to atomize the oil through the small inner duct. A blower fan (right) keeps air moving through the whole heating system.



The blower (right) draws in cool air for re-warming and blows it through the furnace and up the supply duct. Hot gases from the burner heat the air as it passes through The filter removes dust and the humidifier adds moisture to the dry air

is burned, and a surrounding air jacket where the air is heated. To control the amount of air reaching the fire, the furnace has a draft door and a check damper in the smoke pipe.

A furnace for hot-water heating has a water chamber or jacket surrounding the fire pot. This arrangement is called a *boiler*. The hot water flows through pipes to the distributors in the rooms, gives up its heat, then returns to the water chamber for further heating. A steam-heating plant resembles a hot-water system, except that water in the chamber is heated to the boiling point and vaporized. Steam rising from the boiling water travels by pipes to the heat distributors, gives up its heat, and forms water (*condensate*). The condensate then flows back to the water chamber.

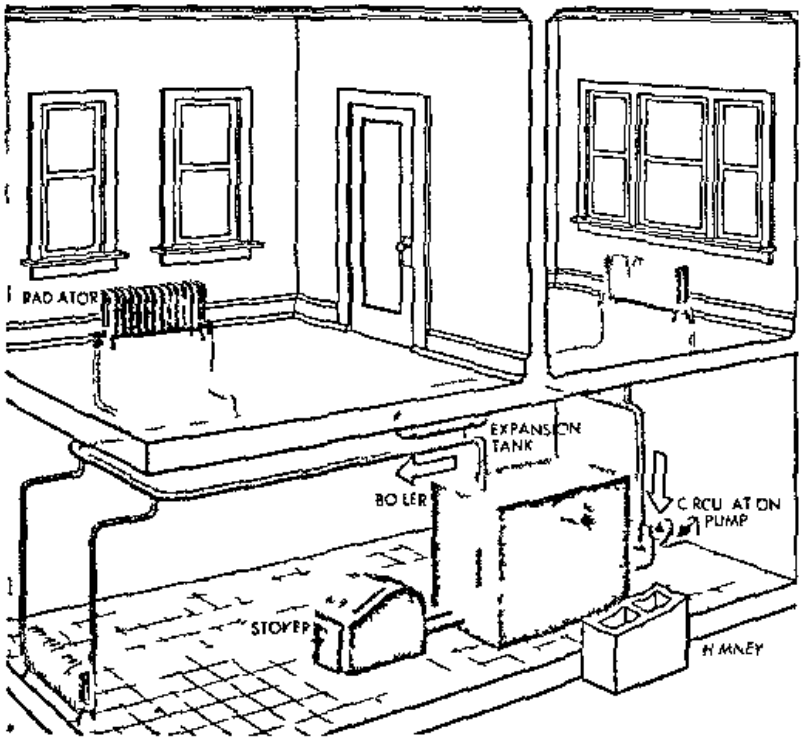
Generating the Heat

The furnace fire may be fed by coal, coke, oil, or gas, or the heat may be produced by electricity. Each of these may be used in warm air, hot water, or steam systems; the choice depends usually on availability or cost Anthracite is preferred for coal-burning furnaces, because it is long burning and almost smokeless. Sometimes a semibituminous coal called Pocahontas is used because of its lower cost Coke burns with a clean flame, without soot or smoke, and is easy to handle in hand firing a furnace Oil and gas are popular because they are fed automatically and burn completely They leave no ash or residue other than a small carbon deposit.

To eliminate the labor of shoveling coal into the furnace, many buildings have *stokers* which automatically feed coal into the fire box. Coal is fed from the hopper to the fire box by a screw or ram. A fan blows air needed for burning into the fire box through a ring of nozzles called *tuyères* To fill the hopper itself, a second screw may transport coal from the bin to the stoker. Some stokers also remove ashes automatically.

Before oil can be burned efficiently it must be atomized—that is, broken up into tiny particles. This may be done by a steam or air jet, or by a centrifugal device that spins the oil off the edge of a disk or cup. The *gun* type of oil burner provides a pump to feed the oil and a blower for atomizing and to supply air for burning

HOT-WATER HEAT WITH COAL AS FUEL



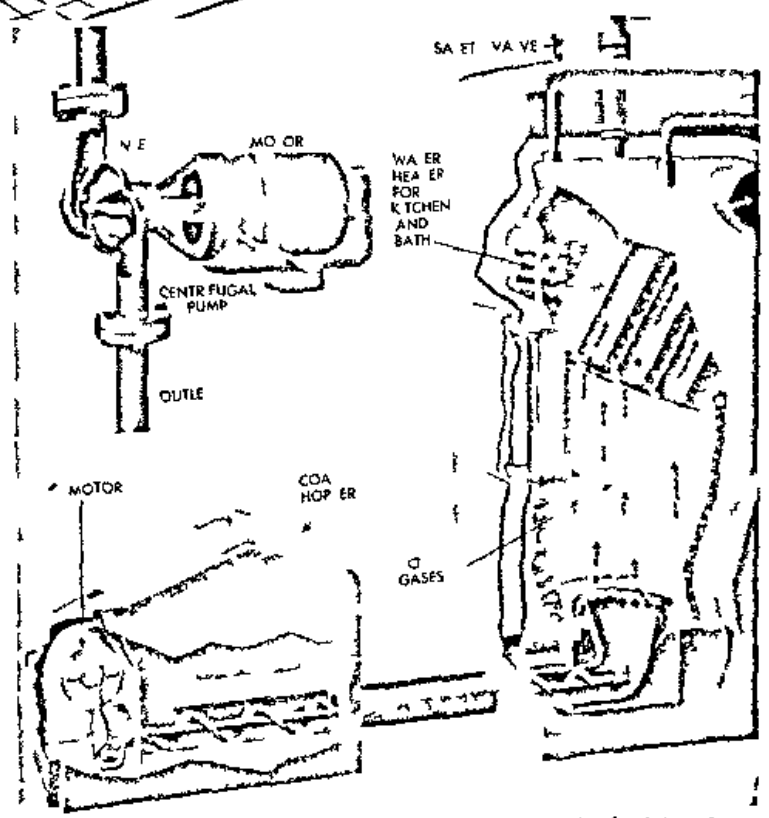
Gas furnaces may receive a continuous supply from city gas mains or from portable tanks which store the gas under compression Most gas burners are of the Bunsen type and burn gas with a nonluminous or blue flame (*see* Bunsen Burner) Air is mixed with the gas before it reaches the burning point and more air is introduced by draft around the flame to aid the burning process

Carrying Heat to the Rooms

Once the heat-carrying fluid—air, water or steam—is properly warmed in the furnace or boiler it must be carried in ducts or pipes to distributors in the rooms There must also be a return system for the fluid because it is more economical to reheat the still partially warm air or water *than to introduce* a new supply of outside air or cold water into the system

Hot-air systems have sheet-metal ducts running to room outlets called *registers* One duct carries warm air into the room another duct returns cooled air to the furnace for reheating Simple systems work by letting warm air rise naturally in the duct As the warm air enters the room the cooled air drops through its register and duct A more efficient method provides a motor-driven fan This keeps a constant flow of air in the system With a fan the ducts can be much smaller

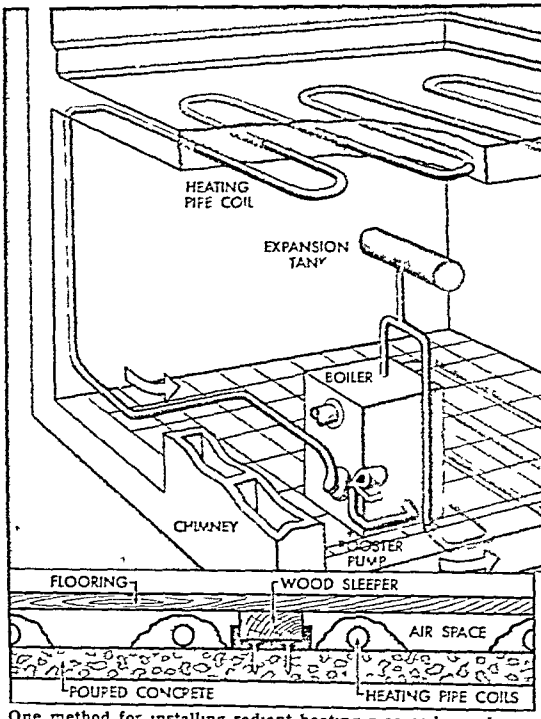
A warm-air system can be equipped with a simple humidifier to add needed moisture to the hot dry air This consists of a flat pan located in the furnace air jacket and a water-feed arrangement that keeps the pan filled In a forced air system an air filter can be located in the cold-air return duct to trap the dust in the air



The top picture shows a monoflow pipe system for hot water heating as explained in the article Below it are the stoker and boiler with the booster pump shown in the panel at left The stoker drives coal into the furnace where it burns in the combustion chamber aided by air from the tuyères Hot gases heat the water for the system and *also water* for the kitchen and bath The expansion tank takes in overflow and the booster pump helps the water circulate

Pipes for carrying hot water from the boiler and cooler water back may be arranged in a single-pipe *monoflow* system or in a two-pipe system In the first each radiator is attached to the line by two short pipes The hot water enters from the upstream" side and the cooler water discharges into the downstream side Thus cooler water from the first radiator mixes with hot water on its way to the second radiator and so on through the house Successive radiators along the line must have larger surface areas because each one receives cooler water than the one before In the two-pipe system the unit takes hot water from the feed line and discharges cooler water into the return line Usually the lines run parallel through the house

RADIANT HEATING BRINGS EVEN TEMPERATURES



One method for installing radiant-heating pipe coils is shown here. The pipes are embedded in the floors, with risers and returns in the walls The boiler, booster pump, and expansion tank work in the same way as conventional hot-water systems. The cut-away picture shows the details of installing pipe coils.

Power for circulation may come from gravitational force alone or be aided by a booster pump. Hot water is less dense than the cooler water, and so rises naturally, aided by convection currents, while the cooler and denser water falls. The water actually expands when heated, so there must be an *expansion tank* in the system to hold the greater volume of hot water temporarily.

In the so-called "open" system, the expansion tank is located above the highest distributing unit and is open at the top. The whole system operates under normal atmospheric pressure, with the maximum temperature of the water limited to about 200° F. For greater heat in the radiators, a closed system is installed. The expansion tank is sealed and is generally located near the boiler. When the water is heated, it expands against air in the tank. The air becomes compressed and exerts greater than atmospheric pressure against the water. This added pressure permits the water to reach temperatures higher than 212° without boiling.

Pipes for steam heat are similar to those for hot-water heat. A one-pipe system carries steam to the heating unit and returns the condensate along the same line. A two-pipe system carries steam in one line and condensate in the other. Air in the system may be driven out through a valve in the heating unit by pressure of the incoming steam; or it may be exhausted from the whole system by a vacuum pump. With a partial vacuum in the system, steam can be formed at temperatures as low as 160° F.

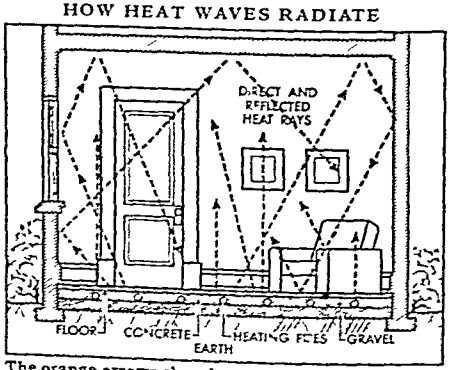
In an ordinary steam system without a vacuum pump the steam must enter the heating unit under pressure to force the air out through a small escape valve. For removing air and condensate, the *vapor* system provides a trap in the pipe leading to the return line. This trap has a gate that allows water and air to pass freely, but closes when steam reaches it Thus condensate and air flow out, but steam remains until it loses heat and liquefies. Some steam plants have both vacuum and vapor systems.

Some cities have large steam- or hot-water heating plants that supply heat for many buildings within a certain zone. This method is called *central* or *district* heating. Customers are charged for steam heat by the amount of condensate returning to the boiler

Heat-Distributing Units

The simplest heat-distributing unit, the *register*, is used with hot-air systems. Gravity hot-air systems have both supply and return registers on the floor or on the lower part of the wall. Forced-draft systems may have the supply register high on the wall and the return register lower down, or both registers may be high. The registers usually have dampers for regulating the air flow.

HOW HEAT WAVES RADIATE



The orange arrows show how radiant heat waves rise from the floor, pass to the walls, ceiling, and the objects in the room. They reflect back and forth until everything is equally warm. There are no spots of concentrated heat to set the air moving in drafts.

For hot-water or steam systems, the commonest heating unit is the *radiator*. This unit is somewhat misnamed because it gives off heat mainly by convection, although both radiation and conduction take place as well. The ordinary radiator is made up of hollow sections of cast iron, wrought iron, or steel, spaced to allow the full surface of each sec-

t on to be exposed Hot water or steam flow ng through each section warms the radiator sur faces and these in turn give off heat to the sur rounding air Rad ators usually have a valve for controll ng the steam or hot-water supply Steam radiators are generally smaller than those for hot water because sur faces heated by steam give off greater heat

Anotl er device for d stributing hot-water or steam heat is a *convec tor* Th s consists of one or more copper tubes that pass through a long file of closely spaced metal sl eets or *fins* The fins are fitted or soldered to the tubes and the whole arrange- ment is placed near the bottom of a rectangular shaft open at top and bottom The shaft may be the sect on of the wall under a recessed window or a metal cabi net in the room Steam or hot water passes through the tubes and these in turn transfer heat to the fins The shaft acts as a chimney drawing cold air from the floor level and through the heated fins The air now warmed passes through the gr lle at the top of the shaft and into the room

Panel or Radiant Heating

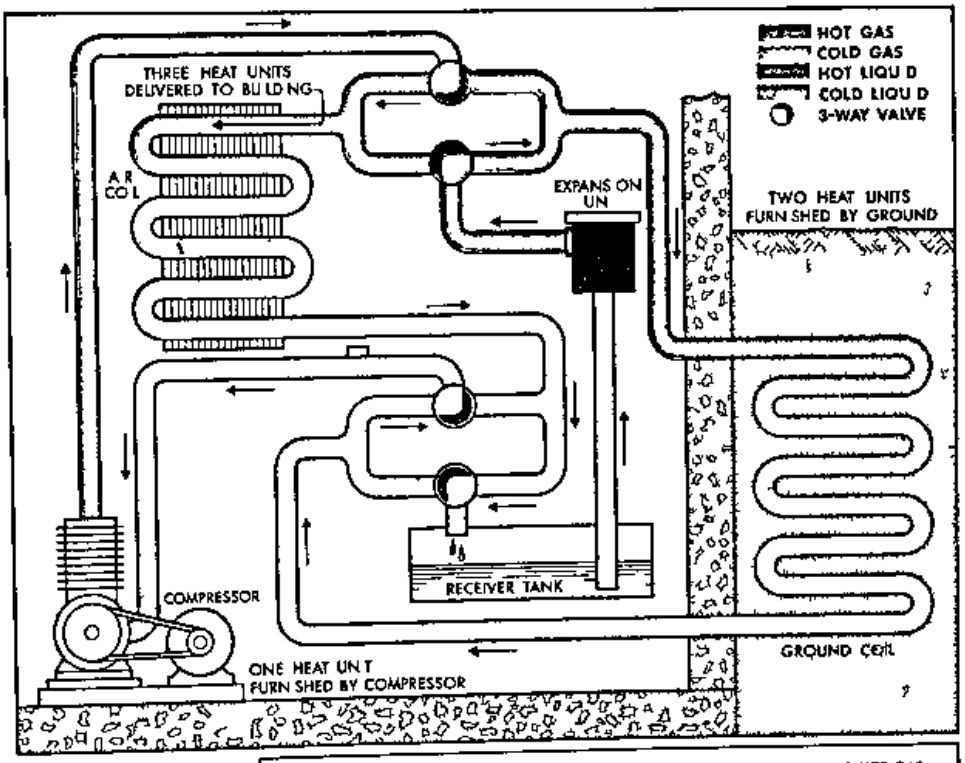
Radiators and convectors have several d s- advantages They take up needed space in the room are often out of harmony with the room furnish ngs and do not heat uniformly To overcome these difficult es many bu ldings are being equipped with *panel* or *radiant* heat ng

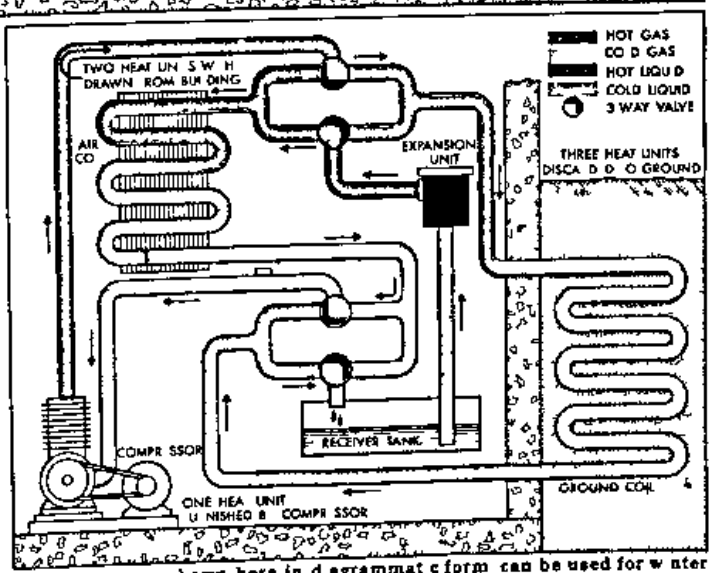
Actually radiant heat ng is any method that suppl es l eat by radiation but the term is widely used to describe heating units that are concealed in walls floors or ce l ngs These actually supply heat mainly by radiation there is also some convection and conduction action S nce the installat ons are concealed many engineers prefer to use the term panel l eaters

Warm air can be used for radiant heating in a floor or ceil ng support constructed of rows of hollow tile A warm-air duct carries heat into one end of each row the air passes through giving up its heat to the floor The cooler air then passes to a return duct at the other end of the row Hot-water pipes can be embed led in the floor or in the plaster ceil ing They can also be embed led in plaster walls These pipes may be arranged in a continuous coil or in a grid pattern Still other radiant heat units may be tempered glass panels with an electric re- s stance coil fused to the back The whole arrange- ment is embedded in the wall

Radiant heat warms the walls ceiling floor and objects in the room to a comfortable temperature while the air remains at a lower temperature Since every surface in the room is warm an occupant does not lose his own body heat to them by radiation The air remains at about the same temperature and there are no updrafts and downdrafts caused by heat The pleasing effect of radiant heat is the same as that

USING THE EARTH FOR HEATING OR COOLING





The heat pump shown here in d agrammat c form can be used for w nter heat ng top p cture) or summer coo ng lower p cture) The only power needed s used to run the comp essor Three way valves are turned to send hot refr gerant gas through the bu ld ng in w nter and co d l qu d in summer Some systems use a r or ground water instead of earth

experienced outdoors on a winter's day when the air is still and the sun is bright.

Controlling the Heating System

Modern systems deliver heat in response to the wishes of the occupants of the building and to changes in outside temperature. The device that controls the heat delivery is called a *thermostat*. The heart of the thermostat is a *primary* or *sensitive element*. This has physical properties affected by temperature changes. The element may be a strip of two metals, usually steel and brass, brazed together; a bulb of mercury; or a material similar to hard rubber. Changes in the primary element work through an electric current or compressed air to move a valve, damper, switch, or pump (*secondary* elements). These actually control the heat flow.

In a simple bimetal strip thermostat, temperature changes cause one metal to expand or contract faster than the other. This causes the strip to curl and close an electric contact. The current then starts a motor which may regulate an air damper, a stoker, a gas- or oil-supply line, or a pump or valve in the distribution system. Eventually the flow of heat is regulated to restore the room to the desired temperature.

The sensitive element in a compressed-air thermostat is a tube made of ebonite, a kind of hard rubber. Expansion or contraction of the tube changes the rate of air leakage through a nozzle. This changes the air pressure on a flexible bellows or diaphragm, which in turn controls the secondary element.

The mercury thermostat works by direct expansion of the mercury through a capillary tube. This produces a pressure which in turn governs the action of a regulating device. Radiators may also be individually controlled by self-enclosed thermostats that act directly on the supply valve.

Sometimes there is a very considerable lag between changes in outdoor temperature and the rise or fall of heat in the room to compensate for those changes. In the meantime the room may grow uncomfortably hot or cold. To prevent this, heating engineers now install outdoor thermostats to work with those in the building. These anticipate necessary changes and help keep the room at the desired temperature.

Heating by "Refrigeration"—the Heat Pump

A body of air, water, or earth, even when quite cool—say at a temperature of 55° F.—actually contains a great amount of heat. If this temperature were lowered by five degrees, the body would give up a quantity of heat, which could be captured for heating homes. The revolutionary heat pump, shown in diagrammatic form on the previous page, takes heat from air, water, or earth by cooling it.

The pump uses the same cooling action that takes place in the home refrigerator (*see* Refrigeration). Instead of the cooling process taking place in the box, it takes place in air, in ground water, or in the earth somewhere below the frost line. The action can be reversed in summer for cooling.

This device is most practical in regions where the lowest temperatures are not extreme. With air as the heat source, pumps are now being used in the Southwest. They also work where there is a large supply of ground water at a winter temperature of about 55°. Both air and water are discharged after cooling. Pumps in the earth must have longer coils since the earth renews its own heat slowly.

Capturing the Sun's Heat Indoors

Even on a winter's day in the temperate zone, the sun radiates a good deal of heat to the earth—enough to warm a house during the middle hours of the day, if plenty of window surface is provided for the sun's rays to enter. To capture this *solar heat*, houses are now being built with a broad, unbroken expanse of window along the south side.

Eaves or projections above the solar window prevent the summer sun from shining in. But the lower winter sun can deliver its heat directly. A conventional heating system, governed by thermostats, supplies heat during the night and parts of the day when solar heat is insufficient. An experimental house near Boston, Mass., uses tons of Glauber's salts to store solar heat during the day. When the sun goes down, the salts cool and give off their heat to the house.

HEBE (*hē'bē*). In the Greek mythology this goddess Hebe typified eternal youth and joyousness. She was a comely maiden, with sparkling eyes and rounded form, ever smiling; and Milton in his famous poem 'L'Allegro' speaks of—

> Nods, and becks, and wreathèd smiles,
> Such as hang on Hebe's cheek.

She was the daughter of Zeus (Jupiter) and Hera (Juno) and served the gods as cupbearer, until one day she tripped and fell. Then the lovely youth Ganymede took her place, and Hebe became the wife of Heracles (Hercules) after he was deified.

HEBREW LANGUAGE AND LITERATURE. To most persons of European descent the chief representative of the Semitic tongues is Hebrew, the sacred language in which most of the Old Testament was written and in which its Scriptures are still read in the Jewish synagogues. The Semitic languages (a group of Asiatic and African tongues) are divided into two great branches, the northern and the southern. To the former belong Hebrew, Phoenician, Aramaic, and Assyrian, while Arabic and Ethiopic are of the second group. Hebrew and Phoenician are so closely related that they are considered as dialects of one tongue.

The Hebrew language is very ancient and was spoken in Palestine as early as 2,000 years before Christ. The words are short, for the most part, and the grammar and sentence construction are simple. Much is expressed in a few words, and, though often rude, the language has strength, grandeur, and a deep sonorous quality well suited to poetry and the expression of religious feeling. As in other Semitic tongues the parts of speech are derived from roots or word stems having three letters. Originally the Hebrew alphabet was made up entirely of consonants and the vowel sounds were omitted. Early in the Christian Era, however, vowel signs were inserted underneath the consonants as is done today in some systems of short-

hand (See vowel points in Alphabet table FACT-INDEX) The writing reads from right to left, as in Arabic, and from the back of the book to the front

Parts of the books of Daniel, Ezra, and one verse in Jeremiah are written in Aramaic, the rest of the Old Testament is written in Hebrew Thus and a few inscriptions are all that remain to us of ancient Hebrew literature In daily speech the Jews gradually adopted the Aramaic language of their Syrian neighbors, but they preserved Hebrew as a religious and literary language In the first four or six centuries of the Christian Era there grew up a great body of writings known as the *Talmud* (meaning "teaching" or "learning"), consisting of two parts The first of these, the *Mishna*, or oral law was written in Hebrew, the second, the *Gemara*, or commentary on the law, in Aramaic The Mishna is a systematic collection of religious legal decisions developing the laws of the Old Testament The Gemara is a great unordered mass containing arguments and opinions on the law and much miscellaneous material It has been called a 'literary wilderness" Discussions and hair splitting arguments are interrupted by charming tales and parables In its pages are poems, prayers, anecdotes, and maxims, together with science and mathematics The Talmud formed a bond between the scattered Jews and kept alive their learning during the Dark Ages It helped them play a large part in the restoration of learning during the Renaissance

In the Middle Ages a literature evolved which embodied the *Cabala* a mystical interpretation of the Scriptures based on the assumption that every letter and number had a hidden meaning

Hebrew lends itself well to devotional poetry, and since the days of the Psalmists there have been outstanding Hebrew poets in every age Two of the greatest were the 12th-century Spanish Jew, Judah Halévy, and, in modern times, Chaim Nachman Bialik

From early days the Jews have adopted the language of the country in which they happened to dwell Even in the 1st century B C, Josephus, the great Jewish historian, wrote for the most part in Greek, probably because he could thus reach the greatest number of readers His immortal 'History of the Jewish War' was written first in his native Aramaic and then in Greek, but only the Greek version has come down to us Moses ben Maimon (generally called Maimonides), the great Spanish Jewish rabbi, philosopher, and physician of the 12th century, wrote mainly in Arabic

In Germany the Jews adopted German as their language, but they wrote it in Hebrew characters When persecution drove great numbers of them to the countries of eastern Europe, they carried this practise with them Mixed with some Hebrew and Slavic words, and written in Hebrew letters, this German dialect developed into the language known as *Yiddish* (from the German *jüdisch*, Jewish) It is widely used today among the Jews born in central European countries, being slightly modified by the addition of words from other languages Within the last century an extensive literature has developed, and there are a number of newspapers and periodicals in Yiddish in the United States and other countries The best of world literature has been translated into Yiddish

Although Hebrew ceased to be a spoken language for centuries, as a literary language it never entirely died out In recent times there has been a revival of interest in it as part of the revival of all Jewish traditions Periodicals and books are appearing in Hebrew and it is now recognized as the official language of Israel

HEBRIDES (*hĕb'rĭ-dēz*) **ISLANDS** Shortly before the Irish missionary, St Columba, died in 597 he looked out upon the tiny island of Iona in the Hebrides, or Western Isles, of Scotland and made a memorable prophecy "Unto this place, albeit so small and poor, great homage shall be paid not only by kings and peoples of the Scots, but by the rulers of barbarous and distant nations, with their people also" And so it happened His work and that of his disciples made this island of only five square miles the most famous center of Celtic Christianity From it missionaries went to win converts in Scotland and northern England To it students flocked for centuries from all parts of the north Kings and chiefs were brought to it for burial so that their dust might mingle with that of the "blessed isle"

From the end of the 6th century to the end of the 8th Iona's fame was scarcely second in importance to any of the British Isles Then the vikings swept down from the north to conquer the islands, and not until the 13th century did the Norwegian kings give way to the Scottish kings

Semifeudal conditions continued until 1748 under the rule of native chieftains Great depression followed the changes then introduced Rents became excessively high, and large numbers of the tenantry emigrated to North America In 1846 a potato blight brought practically the entire population to the verge of starvation Thousands were removed to Australia Since then the system of land tenure has been revised, and the hardships of the inhabitants have been greatly lessened

These islands off the west coast of Scotland are divided into two groups, the Outer and Inner Hebrides, by the ocean waterways of the Minch and Little Minch The most important of the Outer Hebrides are Lewis-with-Harris, North and South Uist, Benbecula, and Barra, of the Inner Hebrides, Skye, Rum, Coll, Tyree, Mull, Colonsay, Jura, Islay, and Iona Altogether, the Hebrides number over 500, only 95 are inhabited Of the total area of 2,812 square miles, only a small part is cultivated, the rest being moorland and mountain Sheep farming, cattle raising, fishing, distilling, slate quarrying, and the weaving of Scottish woolens are the main occupations of the people. While the country is poor, the scenery is wild and picturesque, and tourists add to the income of those almost treeless, storm-wracked islands Population of both groups (1951 census preliminary), 53 456

HECTOR REPROACHES HIS BROTHER



In this bas-relief Thorvaldsen, a Danish sculptor, shows Hector bitterly assailing Paris for idling with Helen while Troy is besieged by the Greeks.

HECATE (*hĕk'a-tē*). In Greek mythology Hecate is a minor goddess to whom Zeus gave powers in heaven, on earth, and in the sea. She could bestow wealth, victory in games and war, success in fishing and hunting, and other great gifts. The wide range of her powers probably accounts for her identification with other divinities such as Artemis, goddess of the chase and the moon, and Persephone, goddess of the infernal regions. Her threefold character is thought by some to represent the phases of the moon—waxing, full, and waning.

Because of her power in the lower world and the night, Hecate also became thought of as a deity of ghosts and sorcery. She was supposed to send demons from the lower regions into the world to teach black magic and witchcraft. She was blamed for terrifying dreams. As she traveled the world with souls of the dead she was visible only to dogs, who howled and whined at her approach.

Hecate was sometimes portrayed by artists as having three bodies, placed back to back. Thus she could gaze in three directions at once. Perhaps this was why she became the popular protectress of crossroads. Sometimes she is represented as having three heads—one of a horse, another of a dog, and the third of a lion. "Hecate's suppers" were deposited at crossroads in the scant light of the new moon. These offerings were made to court her favor, to appease her angers and appetites and those of the evil spirits that accompanied her, and to prevent the souls of the dead from appearing. The suppers generally were of eggs, fish, onions, and honey. Her devotees also sacrificed black puppies and black ewes to her—black because she was a goddess of the night.

Some scholars believe Hecate was brought into Greek mythology from Thrace. It is possible that "Hecate" is a short form of a Greek word that means "the one who comes from afar." Homer does not tell of Hecate, but Hesiod represents her as a daughter of Peres, a Titan. Later writers variously describe her as the daughter of Zeus and Demeter, of Zeus and Hera, or of Zeus and Leto. (*See also* Mythology.)

HECTOR. Homer's epic poem, the 'Illiad', makes Hector the tragic hero of the ten-year defense of Troy against Greek siege. Although aided by Apollo, the sun-god, Hector was slain by the Greek hero Achilles. Achilles wore armor made by Hephaestus, god of fire and forge, and was helped by Athena, goddess of wisdom.

Although in English "hector" has come to mean braggart or bully, the Trojan Hector was both noble and brave. The son of Priam, the Trojan king, and Hecuba, Hector was the greatest of Trojan warriors. His wife was Andromache (*ăn-drŏm'a-kĭ*), and their infant son was Astyanax (*ăs-tī'a-năx*). He shared the dangers of battle with his brothers, the bravest of whom was Deiphobus (*dē-ĭf'ō-bŭs*).

How Hector Was Killed

When Hector left Troy's defensive lines to ask the elders and women of the city to pray to the gods for aid, Andromache begged him to leave the battle to others, lest she be left a widow and her child fatherless. Hector refused to be a coward, embraced his child, and returned to the battle.

With Apollo's aid he slew Patroclus, who wore the armor of the Greek's greatest warrior, Achilles. The Trojans rejoiced because they thought the dead man was Achilles. Achilles, however, was sulking in his tent because he believed he had been badly treated by the Greek commander. When news of Patroclus' death reached Achilles, he turned from sulking to anger. He vowed to destroy Hector. Achilles' appearance on the battlefield inspired the Greeks. They drove the Trojans inside the city walls—all except Hector. He awaited the Greek champion.

The sight of Achilles, clad in new armor made by Hephaestus, however, frightened him and he fled. Three times he circled the walls of Troy with Achilles at his heels. Then Athena whispered to Achilles that she would bring Hector to battle. Achilles halted. Athena took on the shape of Deiphobus and deceived Hector into the belief that the two would stand together against Achilles.

So Hector and Achilles met. Achilles' thrown spear missed Hector. Hector did not see Athena return it to Achilles. His own spear glanced off Achilles' god-made shield. Hector turned to take another spear from Deiphobus, but found no one at his side. Then he knew that a god had tricked him. Nevertheless, he valiantly drew his sword and rushed upon Achilles, who awaited him, spear in hand. One thrust of the spear killed Hector.

Achilles terrible vengeance was not satisfied with Hector's death. He fastened the body to his chariot and dragged it three times through the dust around the walls of Troy. Andromache watching the horrible sight from the wall fell fainting into the arms of her maidens.

Achilles' vengeance did not cool. He refused Priam's ransom for the return of Hector's body. Aphrodite and Apollo preserved the body from decay until Achilles' goddess-mother Thetis persuaded him that it was the will of Zeus that the body should be given up. Hector's body was then given to Priam upon payment of much gold and a large quantity of merchandise.

During an 11-day truce the Trojans mourned their hero and burned his body on a lofty pyre. They buried his ashes under a high mound of stones. Soon after the fighting resumed. Troy fell to the Greeks. (*See also* Achilles; Mythology, Trojan War.)

HECUBA (*hĕk'u-bə*). In Greek legend Hecuba was the wife of Priam, king of Troy. Among the 19 children she bore him were Hector, Paris, Cassandra, Troilus and Deiphobus. When the Greek chieftains cast lots for the captive women after the Trojan War, Hecuba fell to Odysseus. According to one account she afterward leaped into the Hellespont. According to another she was stoned to death by the Greeks whom she had violently angered by her bitter abuses.

HEDGEHOG. The hedgehog is found in many parts of Europe. As its name indicates it dwells in hedges and thickets. It sleeps by day and at night it roots in the mold with its pointed snout for such food as insects, snails and eggs. When attacked it rolls itself into a ball, thus exposing no part of its body that is not defended by its sharp prickly spines. It passes the winter in partial or complete hibernation. The common hedgehog of Europe (*Erinaceus europaeus*) is about the size of a large rat. Other species exist which are even smaller. No true hedgehogs live in America, but the name is sometimes applied to the porcupine of the United States and Canada, which resembles the true hedgehog in having a coat of stiff, sharp spines.

THE EUROPEAN HEDGEHOG



The hedgehog gets its name because it dwells in hedges and thickets. It feeds at night on insects, snails, and eggs. When frightened it rolls itself into a tight little ball.

HEDGES. Fences of living green describe two of the principal purposes of hedges, barricade and ornament. A third but less important purpose is cover for birds and small animals. In Europe hedges are much used as fencing for farmers' fields; in America they are more often used as ornament.

No plant meets the requirements of all farmers for an absolutely impassable barrier. From the middle 1800's the Osage orange (*Maclura aurantiaca*) was widely planted by American farmers. Since 1940 the multiflora rose (*Rosa multiflora*), an Asiatic shrub, has been increasingly used in the Midwest and the Northeast. This grows a tangled mass of thorny stems six to eight feet high, bears a fluff of white to pinkish blossoms and serves as a stockproof fence and as cover for birds and small animals. It also is effective in checking water and wind erosion. Unlike other thorny hedges it does not have to be pruned. The honey locust (*Gleditsa triacanthos*), with spiny trunk and branches and with large flat ornamental pods—whose sweet pulp gives the tree its name—is also used for farm hedges. The hawthorn of Europe (*Crataegus oxyacantha*) is subject to many fungus growths and is consequently not planted to any extent in America.

The California privet (*Ligustrum ovalifolium*) is popular where the winters are mild. It holds its leaves nearly all winter and grows closer after each pruning.

Where evergreens are used for hedges the Norway spruce (*Picea excelsa*) is a great favorite. Next perhaps rank the American arborvitae (*Thuja occidentalis*), often called northern white cedar, with its short horizontal branches ascending at the end, and the common hemlock (*Tsuga canadensis*). This is the only hemlock that bears pruning well. The boxwood (*Buxus sempervirens*) is much used in the old formal gardens of Europe.

Many deciduous trees and shrubs also can be used for ornamental hedging. Flowering shrubs are especially effective. Some of the most common are the varieties of *Spiraea* (bridal wreath), the Japanese rose (*Rosa rugosa*), which bears its single flowers all through the summer, the common lilac (*Syringa vulgaris*) and the great paniced hydrangea (*Hydrangea paniculata*). Several species of barberry (*Berberis*) are beautiful and hardy, especially the charming *Berberis thunbergii*, with its low dense growth, its brilliant autumnal tints and the abundant scarlet berries which remain fresh until the following spring. Many species of barberry, however, are under ban owing to the enormous injury they do in harboring the rusts which blight the wheatfields (*see* Rusts and Smuts).

HEIDELBERG (*hī'dĕl-bûrg*). GERMANY. The old university town of Heidelberg is one of the most picturesque spots in Germany. It stands between a wooded height and the Neckar River. Here the river leaves its gorge and enters the plain of the Rhine. The old city consists principally of a long narrow street following the course of the river for about two miles. It grew up at the foot of the castle begun in the

12th century, which crowns the wooded height in the background. Added to at different periods the castle became one of the largest and grandest in Germany. It was largely destroyed during the devastating wars of Louis XIV of France, and though later rebuilt it was struck by lightning and again ruined in 1764. Its ivy-clad ruins are still beautiful, and in an old cellar beneath is the great "Heidelberg tun," an enormous wine cask that can hold 49,000 gallons. Heidelberg University, one of Europe's most famous schools, is the oldest German university, founded in 1385. Once the capital of the Palatinate, Heidelberg passed to the former grand duchy of Baden in 1803. In the second World War, it escaped air raids. American troops captured it without damage in 1945, but the retreating Germans blew up the bridges. Population (1950 census), 116,488.

HEINE (*hī'nĕ*), **HEINRICH** (1797–1856). "I am a Jew—a Christian. I am tragedy—I am comedy." This is what the most gifted poet in 19th-century Germany said about himself. Heine was a man of puzzling contradictions and inconsistencies. He was a true poet and a splendid journalist, a historian without method, a philosopher without a real philosophy, a hater of despotism and an ardent admirer of Napoleon, a cynic who laughed at sentiment, but was himself a sentimentalist. He was born of Jewish parents in Düsseldorf, in western Germany, but later joined the Lutheran church in order to practice law, which he had studied at the universities of Bonn and Gottingen; but he never practiced law.

Heine's heart was in literature. During a visit to a wealthy uncle, his lifelong benefactor, he fell in love with a beautiful cousin. His spurned love found expression in exquisite poems which created a sensation in Germany. His liberal views and his intense admiration for Napoleon made it difficult for him to remain in Germany. He moved to Paris, where he felt at home.

Although Heine wrote much about philosophy, literature, and politics, his fame rests on his poems. Many of these have achieved the popularity of folk songs. They are simple and full of warmth, and they have the freshness and melody of the skylark's note. Some of them, such as 'The Lorelei' and the 'Two Grenadiers', are universally famous. His songs have been set to music by many famous composers. A capricious quality pervades all his writings, even his most tender poems. He shifts from intense passion to careless mockery. One of his poems, 'My Child, We Once Were Children', pictures two children playing house in the courtyard and entertaining company, among them the neighbor's cat; and the sweet, pensive mood of the poem is broken by the satiric stanza:

> Politely we asked how her health was,
> In the course of a friendly chat.
> (We've said the same things since then
> To many a grave old cat.)

It is in his prose writings that Heine's most sardonic flashes of wit appear. The 'Travel Pictures', which is by far the most popular of all Heine's prose writings, strikes a new and fresh tone and is full of sparkling wit. The prologue rings out mockingly at the "laundered bosoms," "polished salons" and "oily speeches."

A disease contracted in his university days at length developed into an ailment which resulted in paralysis. This strange man of contradictions, who had been impatient and irritable in health, showed remarkable endurance and cheerfulness in the long years spent on what he termed his "mattress grave." He died and lies buried in Paris.

Heine is perhaps best known to American readers by his poem 'The Lorelei', familiar to us as a German song. The poem suggests that dreamy time just before the approach of twilight. The sunset in a burst of glory lights up the mountain peaks. A boatman is returning home on the Rhine; he looks up and beholds a glorious sight:

> On yonder height there sits
> A maiden wondrous fair,
> Her golden jewels sparkle;
> She combs her golden hair;
> With comb of gold she combs it
> And sings, so plaintively,
> A strain of wondrous beauty,
> A potent melody.

Drawn by the enchanting power of her song, the boatman gazes upward at the beautiful maiden and fails to see the dangerous rocks below. Suddenly there is a crash, and boat and boatman are lost in the waves. In this story Heine makes use of an old legend which had grown up about a high and dangerous rock on the bank of the Rhine, called the Lorelei or "elf-rock." It is at a narrow part of the river, about 23 miles south of Coblenz, near St. Goar. The rock has a remarkable echo, and it is from this probably that the legend of the enchanting song arose.

HELENA, MONT. In 1864 a gold strike made by four prospectors nearly ready to quit led to the settlement of Helena, Montana's capital. The gully in which they found gold they called "Last Chance Gulch." Today Main Street runs along the bottom of this gulch, and parallel to it are strung an interesting mixture of mining camp structures and modern buildings.

Helena lies in west central Montana at an altitude of 4,124 feet, some 48 miles north-northeast of Butte and about 12 miles west of the course of the Missouri River. Mount Ascension and Mount Helena lie immediately to the south, the Big Belt Mountains to the east, and spurs of the Rockies to the west. The site is broken by numerous gulches.

The capitol was built in 1899, on a high, level site; two wings were added in 1911. Atop its copper dome rises a small reproduction of the Statue of Liberty. The Roman Catholic Carroll College, for men, is here, and the city has both Roman Catholic and Episcopal cathedrals.

The city is a trade and distributing center for surrounding mines, ranches, and farms. Its industries are small, and most of the city's workers are employed in state, federal, and county service.

Members of the Lewis and Clark Expedition visited the site in 1805 (*see* Lewis and Clark Expedition) In 1875 Helena was made capital of Montana Territory and it remained the capital when Montana became a state in 1889 The first rail line reached the city in 1883 In 1935 a series of earthquakes severely damaged the city Helena has the commission form of government (*See also* Montana) Population (1950 census) 17 581

HELGOLAND As an aftermath of the second World War the island fortress of Helgoland was reduced to crumbling ruins The tiny triangular-shaped island lay 28 miles northwest of the mainland of Germany guarding the entrance to the Elbe and Weser rivers and the western end of the Kiel Canal Heavy German defenses once earned it the title Gibraltar of the North Sea In 1947 the British evacuated the 2 500 inhabitants then crumpled the island with thousands of tons of explosives The blast tore away the entire south end of the island and wiped out the steel and concrete emplacements

Helgoland is the farthest seaward of the Frisian Islands It is bordered by red sandstone cliffs which in some places drop 200 feet to the sea Constant pounding by the sea is gradually wearing the rock away Surrounding reefs and rock ledges show that the original size was five times as great as its present 150 acres Germany obtained the island from England in 1890 in exchange for concessions in East Africa It has never had any value other than as a fortification site

HELIOTROPE The poet Thomas Moore called the dainty heliotrope the flower enamoured of the sun The flower got its name from the Greek words *helios* (sun) and *trope* (turning) because its one-sided spikes of fragrant flowers were always supposed to turn toward the sun In the 18th century a French botanist sent some of its seed from Peru to the royal garden at Paris There according to a writer of the time women welcomed it with enthusiasm according it their most precious vases naming it the flower of love and receiving with indifference all bouquets in which their favorite found no place

Many wild species of these hairy many branched shrubs are found in the warm and temperate regions of the world Cultivated varieties give an added charm to greenhouses and gardens They grow from one to two feet high with flowers varying in color from purple to violet and even white Because of their vanilla like odor the flowers are used in making perfume and sachet powder

The heliotrope is a genus (*Heliotropium*) of the borage family (*Boraginaceae*) There are about 220 species in the temperate and warmer parts of both hemispheres The Peruvian heliotrope (*Heliotropium peruvianum*) is the most common The lance-shaped leaves are alternate and petioled the tiny flowers grow in one-sided curved spikes the calyx is five-parted the corolla salver-shaped

HELIUM This *unique* gaseous element was discovered in the sun before it was known on earth In 1868 Pierre Jules César Janssen identified a new element in the spectrum of the sun J Norman Lockyer named it helium (from the Greek word *helios* sun) Then in 1895 the same element was found in an *ore of* uranium

Helium is the lightest of the inert gases (*see* Periodic Table) Its lifting power is 92 per cent of that of the explosive gas hydrogen The inertness and lifting power make it the best gas for use in blimps weather balloons and stratosphere balloons

Helium is used in medicine in place of nitrogen to dilute oxygen The mixture saves divers and caisson workers from the bends because helium does not dissolve in the blood as readily as nitrogen (*see* Caisson) Asthma patients are often placed in an atmosphere of helium and oxygen to make their breathing easier Helium is used in arc welding to shield metal from air and keep it from bursting into flame In this way inflammable metals like magnesium can be welded successfully

Helium gas turns to a liquid at −452° F This is the lowest liquefying temperature of any gas With laboratory methods involving liquid helium physicists have created temperatures within a tiny fraction of a degree of absolute zero (*see* Heat)

The United States has virtually a monopoly on helium production It is extracted from natural gas occurring in several states Helium is separated from other gases by cooling the mixture to about −300° F The other gases liquefy and gaseous helium may be drawn off and purified Two isotopes of helium occur in nature Helium 4 is abundant but helium 3 exists only as a trace A radioactive isotope helium 6 has been produced artificially

Helium plants are owned by the federal government One big plant at Exell Tex supplies all peacetime needs Other plants at Amarillo Tex Otis Kan and Shiprock N M are held in standby state Helium was first produced in large quantities in 1917 intended for use in dirigibles Its price then would have been more than $2 000 a cubic foot Now it sells for about 1½ cents a cubic foot (For diagram of the helium atom *see* Atoms Ions and Ionization)

HEMINGWAY ERNEST (born 1898) Out of the horror of war and the disillusion of postwar life Ernest Hemingway drew powerful novels and short stories He also found rich material for fiction in the world of sports—boxing bull fighting hunting and fishing But he went beyond surface violence to probe the souls of men in conflict Many critics consider Hemingway the finest American writer of his time

Hemingway was born in Oak Park Ill a suburb of Chicago on July 21 1898 His father Clarence E Hemingway was a doctor At their country place in Michigan he taught the boy to hunt and fish In high school Hemingway played football and wrote for school papers He also took boxing lessons As he reached manhood he was more than six feet tall with a big muscular body He was shy and had few friends

After high school he got a job on the *Kansas City Star* America had already entered the first World

War. Hemingway tried to enlist but was rejected because of an old eye injury. He volunteered as an ambulance driver on the Italian front, and in 1918 he was badly wounded.

For a few years after the war Hemingway worked as a reporter. Then he settled in Paris. He had already begun to write fiction, but now he applied himself seriously. He submitted his work for criticism to the poet Ezra Pound and to Gertrude Stein, an able adviser to many writers. From them he learned how to write with strength and direct simplicity.

ERNEST HEMINGWAY



Hemingway wrote great novels and short stories of men in violent conflict.

His first two books did not sell well. His novel 'The Sun Also Rises' (1926) made his name known. It tells of young people in postwar Paris and how they grope to replace their lost moral standards. 'A Farewell to Arms' (1929) is about war on the Italian front. The romantic love story is interspersed with scenes of magnificent battle reporting. 'To Have and Have Not' (1937) represented Hemingway's first search for wider social meanings, more fully realized in 'For Whom the Bell Tolls' (1940), a novel about the Spanish civil war. 'Across the River and into the Trees' was published in 1950 and 'The Old Man and the Sea' in 1952. Hemingway also wrote many short stories, a play, and books on bull fighting and big-game hunting. He won the Nobel prize for literature in 1954.

In the 1930's Hemingway lived in Key West, Fla. Later he moved to Cuba. He was a war correspondent in Spain, China, and in Europe during the second World War. He was married four times and had three sons

HEMLOCK. An easy way to tell the hemlock from its relatives the pines, firs, and spruces is to note the branches and needles. The branches are plumelike and drooping, and the needles are short, flat, and blunt-tipped. They also are whitened beneath. The tiny oval brown cones hanging from the branches are usually only about half an inch long. In spring the tips of its dark-green sprays light up with the yellow-green color of new foliage. This contrast makes the hemlock one of the most picturesque of American trees.

Hemlocks are tall and pyramidal in shape. They grow to an average height of 60 or 70 feet. The soft wood has a tendency to warp. It serves as a substitute for pine and is widely used in interior decoration. The bark is used extensively in tanning.

There are two chief species. The Canadian hemlock is found in eastern Canada and in the United States as far south as Georgia and as far west as Minnesota. The western hemlock is found on the Pacific coast and as far east as Montana.

The name hemlock is also applied to certain poisonous plants of the parsley family, which are widely distributed over the United States and Canada. The water hemlock (*Cicuta*) grows in marshy places. It is also called wild parsnip. It is one of the most poisonous plants of North America. The poison hemlock (*Conium*) grows in dry places. This is supposed to be the plant from which the ancient Greeks obtained the poison they used to execute criminals.

Scientific name of Canadian hemlock is *Tsuga canadensis*. The western hemlock is *Tsuga heterophylla*. The bark is reddish or gray, becoming furrowed with age. The leaves are linear and are one-half inch long. They grow singly and opposite each other. The cones are very small and thin-scaled. The fruit consists of winged seeds.

HEMP. This flourishing plant serves the wise and destroys the foolish. Its fibers make valuable textiles, but it yields a dangerous narcotic drug, called "hashish," or "marihuana."

Hemp has been cultivated for thousands of years in its native Asia and was long ago carried to many other regions of the world. For centuries it was one of the most important raw materials for textile fibers. Rope, coarse cloth, and the sails of ships were made of it. The very name canvas probably comes from the Latin word *cannabis*, meaning "hemp," though canvas now is usually made of cotton.

THE CANADIAN HEMLOCK



The trunk of the Canadian hemlock is shown at the right. At the left are hemlock branches with their short, flat, blunt needles and their oval cones. The tiny winged seeds spread the hemlock to new growing places. Wind often carries them to the sides of high mountains, where they take hold.

GROWING MANILA HEMP AND STRIPPING ITS FIBERS



Like banana plants, Manila hemp grows in stalk clusters (left) They are cut when they are two years old and from 6 to 12 feet tall A Japanese worker in the Philippines strips a stalk of Manila hemp (right) The fibrous layers come off in ribbons called tuxies These will be scraped free of pulp and the fibers hung out to dry

The Cavaliers at Jamestown and the Pilgrims at Plymouth early planted hemp and from it wove their homespun clothes From hemp were woven also the tops of covered wagons that carried pioneers into the West

Modern Uses for Hemp

Today hemp is little used for rope because abaca (Manila hemp) is lighter and more resistant to water Jute has replaced hemp for making coarse cloth and similar products (*see* Jute) But hemp is still used widely for making strong and durable twines high-grade belting and webbing and oakum and other kinds of packing Oil from the seeds is used in making soaps paints, and varnishes The seeds are also fed to birds

Hemp fibers come from the inner bark of the plant s woody stalks After the stalks are cut they must "ret' or rot so the outer bark can be removed easily The plants are either soaked in concrete pools or left on the ground to absorb rain and dew Then the stalks are gathered and shocked Next they pass into a hemp break Here rollers break the woody cores into short pieces ('hurds) A scutcher with revolving drums combs out the long fibers (line) from the hurds The remaining short fibers (tow") are cleaned by hand or a tow machine

The production of hemp for its fiber is an important industry in China, India, Russia Italy and Hungary In the United States hemp is a minor crop and the greater part of its supply is imported

A resinous substance in the leaves stems, and flowers of certain types of hemp is the source of hashish, or mari huana This has been used as a drug since ancient times It has a sinister effect upon habitual users, and many commit crimes while under its influence (*see* Assassins Narcotics) The Federal government classifies marihuana as a narcotic drug and cooperates with other nations to regulate its distribution and to prevent its abuse

The term hemp is also used to designate fibers from such plants as Manila hemp (abaca), sisal hemp and the Sunn hemp in India These plants are not related to the true hemp plant The sturdy abaca plant fiber grows 6 to 12 feet long It is native to the Philippines and belongs to the banana family It was introduced in Central America during the second World War and became a successful crop Abaca is used in ropes requiring strength and flexibility, such as ships cables and in the best grades of twine Sisal is used for making ropes of small diameter and hard fiber twines (*see* Sisal)

TRUE HEMP PLANTS



The female or pistillate plant of true hemp (left) is dark and luxuriant The male or staminate plant (right) is pale and spindly The plants vary from 3 to 16 feet high

All cultivated true hemp is produced from *Cannabis sativa* This is an annual herb of the mulberry family varying under cultivation from 3 to 16 feet in height and having angular rough stems and alternate deeply lobed leaves Male and female flowers grow on separate plants The female (pistillate) plant is taller and more luxuriant and has darker foliage than the *male (staminate) plant Manila* hemp comes from the *Musa textilis* (*See also* Rope and Twine)

HENNEPIN, LOUIS (1640?–1706?). "Anybody but me," boastingly writes Father Hennepin, "would have been very much frightened at the dangers of such a journey as that upon which La Salle now dispatched me." This journey was to be from Fort Crèvecoeur, near the present site of Peoria, Ill., down the Illinois River to the Mississippi, and thence up the Father of Waters towards its source

The man to whom was confided this undertaking was a Franciscan monk from Belgium. He had come to America in 1675 on the same ship that brought La Salle. Love of adventure and religious zeal led him to become a missionary to the Indians, and in 1678 he was overjoyed when he was given permission to accompany La Salle on his great trip of exploration.

Two years later he set out on his dangerous journey from Fort Crèvecoeur. And dangerous it proved, for Father Hennepin and his two companions were captured by the Sioux Indians and carried in canoes up the Mississippi. While in the northern country Hennepin discovered the falls in the Mississippi where Minneapolis now stands. He named them the Falls of St. Anthony, after his patron saint, St. Anthony of Padua.

Soon Hennepin was released by the Sioux, and returned to Quebec and thence to France. There he published his 'Description of Louisiana' on which his fame rightfully rests. Unfortunately, some years later, after the death of La Salle, Hennepin published another book in which he claimed that he also went *down* the Mississippi and discovered its mouth before La Salle made his memorable journey. This falsehood has greatly dimmed the glory which rightfully belongs to Father Hennepin, because for many years people were afraid to trust his first accounts of what he really had done.

HENRY, HOLY ROMAN EMPERORS Seven rulers of this name are counted in that union of Germany and Italy which is called the Holy Roman Empire (*see* Holy Roman Empire). HENRY I, "the Fowler," was king of Germany from 919 to 936, but never concerned himself with Italy and his power even in Germany was weak outside of Saxony. HENRY II, called "the Saint" (reigned 1002–1024), was the last of the Saxon house; he made three expeditions into Italy and was an earnest supporter of church reform. HENRY III was a member of the Salian line, and in his reign (1039–1056) the kingdom of Burgundy was added to the empire.

HENRY IV (reigned 1056–1106) succeeded his father, Henry III, when he was less than six years old. He grew up wilful and headstrong amid bitter contests over the regency. A few years after he took power into his own hands the storm of the Investiture conflict broke and lasted far into the reign of his son The question was whether the Pope or Emperor—church or state—should control the appointment of bishops and other high clergy, who were not only high officers of the church but great feudal princes exercising power in the state as well.

THE EMPEROR HUMBLES HIMSELF BEFORE THE POPE



When Emperor Henry IV defied Pope Gregory VII, his people revolted, and he was forced to journey across the Alps in the dead of winter to obtain the Pope's pardon. Here we see him at Canossa, after he had been kept waiting without food for three days, ascending the steps barefooted and in penitent's robe to kneel at Gregory's feet.

In 1077 revolts in Germany forced Henry IV to cross the Alps into Italy in the dead of winter, and abase himself before the Pope, Gregory VII, at Canossa Only after standing three days in the courtyard, fasting and barefoot, was he admitted

and the Pope's excommunication raised, on hard conditions It was the most brilliant victory that the papacy ever won over the temporal power It proved, however, to be only an incident in a long struggle which outlasted both Henry and Gregory (*See* Gregory, Popes)

HENRY V (reigned 1106–1125) joined his father's enemies in 1104, and the elder Henry died in defeat at Liége, in what is now Belgium The son, when once seated on the throne, became as staunch an upholder of the imperial claims as his father In the Concordat of Worms (1122) the Investiture conflict was ended by a compromise, which guarded the just rights of both parties Henry V died without children, and the throne then passed to the Hohenstaufen House

HENRY VI (reigned 1190–1197) was the third of the Hohenstaufen line, the able son of the great Frederick Barbarossa and the father of Frederick II, "the wonder of the world" (*See* Frederick, Emperors) The chief event of his short reign was his acquisition by marriage of the Norman kingdoms of Sicily and Naples

HENRY VII (reigned 1308–1313) was the last emperor who sought to obtain the claims and traditions of the medieval Empire He died in Italy, frustrated in his attempts to restore any effective union of Italy and Germany

HENRY, KINGS OF ENGLAND Eight Henrys have sat on the English throne since this name was first introduced into the royal line in the person of Henry I, youngest son of the Norman conqueror, and all except two of these royal Harries (Henry III and Henry VI) were among the ablest sovereigns of that island kingdom But the disfavor created by the crimes and oppressions of the last of the series—the tyrannical Henry VIII, father of Queen Elizabeth I—was so great that no English sovereign since his time has borne this formerly popular name

HENRY I, who reigned 1100–1135, was called "Beauclerc" because, unlike most princes of that age, he was a "good scholar" He is credited with saying that "an unlettered king is only a crowned ass" During the 35 years of his reign England enjoyed peace and prosperity The chronicler of those times wrote that he "was a good man and great was the awe of him, no man durst ill-treat another in his time"

At his accession Henry I issued a famous "Charter of Liberties" which became the basis of Magna Carta, the foundation of the liberties of the Anglo-Saxon world He also favored the church in order to win its support against the pretensions of his elder brother Robert, who claimed the English throne in addition to the duchy of Normandy left him by their father The English were conciliated by his marriage with Matilda, a descendant of the Anglo-Saxon kings And the support of the common people was assured by his repression of the Norman nobles and by the justice he administered through the "King's Court" The "Lion of Justice," he was called

One misfortune darkened Henry's later years His only son was drowned when the *White Ship* sank in the English Channel, and, according to the story, the king "never smiled again" This accident left his daughter Matilda and his nephew Stephen contestants for the throne at his death (*see* Stephen, King of England)

Great Work of the First Plantagenet King

HENRY II, 1154–1189, was the son of Matilda, and the grandson of Henry I His father was Geoffrey of Anjou, called "Plantagenet" from his habit of wearing a sprig of the broom plant (*planta genista*) in his cap, so with Henry II, in 1154, the first Plantagenet king ascended the English throne Two years before he became king, as a lad of 18, Henry had led an army from France to assert his mother's claim, and the wearied Stephen had agreed to a treaty by which Henry was recognized as his successor



HENRY II
The First of the Plantagenet Kings

Henry II was the most powerful prince in Christendom In addition to England and Normandy which he held by his mother's right, he inherited from his father, as French fiefs, the important counties of Anjou, Maine, and Touraine, and by his marriage with Eleanor of Aquitaine he acquired Poitou, Guianne, and Gascony, so that he held most of the British Isles and about one-half of France Frequent wars with his suzerain the French king followed, in which his rebellious nobles took unsuccessful part against him

Henry II re-established law and order after the anarchy of Stephen's reign He improved the military service by permitting the barons to pay "scutage" or shield money in place of serving in the army, with this he hired soldiers who would fight whenever and wherever he wished—an important means of keeping in order the powerful nobles of the land But his greatest work was the reform of the law courts The Curia Regis was brought into every part of England by sending learned judges on circuit through the land to administer the "king's justice," so that gradually one system of law took the place of the many local customs that had been in use He also established the "grand jury" by which accusations could be brought by a body of representatives of the community against evildoers who were so powerful that no single individual dared accuse them To him also we owe the growth of the "petty" or "trial jury," especially in cases relating to land, this substituted the weighing of evidence and testimony by

sworn men for the old superstitious trial by battle or by ordeal. Henry even attempted to bring churchmen who committed crimes under the king's courts, but the scandal caused by the murder of Archbishop Thomas Becket in the course of this quarrel forced him to give up this reform (*see* Becket, Thomas).



HENRY IV
Founder of the House of Lancaster

Henry's last years were embittered by the rebellion of his sons, aided by Philip Augustus of France and by their mother, the unscrupulous Eleanor. The king, old, sick, and discouraged, had to consent to the terms demanded of him. When he saw the name of John, his favorite son, among those of his enemies, he exclaimed, "Now let all things go as they will; I care no more for myself, nor for the world." Two days later he died muttering, "Shame, shame on a conquered king."

Henry III, 1216-1272, son of King John, was a religious man and a good husband and father, but he was a weak and incompetent ruler. Until he became of age officers trained under his grandfather, Henry II, directed affairs, and good order and prosperity prevailed. When Henry III took the administration into his own hands, he squandered the revenues of the kingdom on greedy relatives and favorites. The nobles seized upon his misgovernment as an excuse for rebellion in the Barons' Wars, under the leadership of the patriotic Simon de Montfort (*see* Montfort, Simon de). After Simon was defeated and slain in the battle of Evesham (1265), the people looked to the king's son, Edward I, for good government, and during the last seven years of Henry's reign the country was quiet and prosperous, the king being guided largely by the advice of his gifted son, Prince Edward.

The Lancastrian Henrys

Henry IV, 1399-1413, founder of the royal House of Lancaster, landed in England from unjust exile with only 60 followers. The 60 soon became 60,000, for all classes of people were tired of the mingled weakness and tyranny of Richard II, grandson and successor of Edward III, and he was now deposed and imprisoned. And Henry IV, claiming descent "by right line of blood from the good King Henry III," was seated on the throne by Parliament. But throughout his reign of 14 years his position was insecure and trying. The claim later asserted by the House of York was felt to be a better hereditary title to the throne than that of Lancaster. Scotland was restless, newly conquered Wales broke into open revolt, and the powerful family of the Percies, to whose aid Henry IV owed much in gaining the throne, took arms under the famous "Hotspur." So Henry perforce was obliged to keep on good terms with the church, and to permit the newly arisen Parliament to exercise powers in the government which became a notable precedent in later struggles between Crown and Parliament. Shakespeare represents him as speaking these words on his death bed to his son and successor, Henry V:

> Heaven knows, my son,
> By what by-paths, and indirect crook'd ways,
> I met this crown; and I myself know well,
> How troublesome it sat upon my head:
> To thee it shall descend with better quiet,
> Better opinion, better confirmation;
> For all the soil of the achievement goes
> With me into the earth. . . .

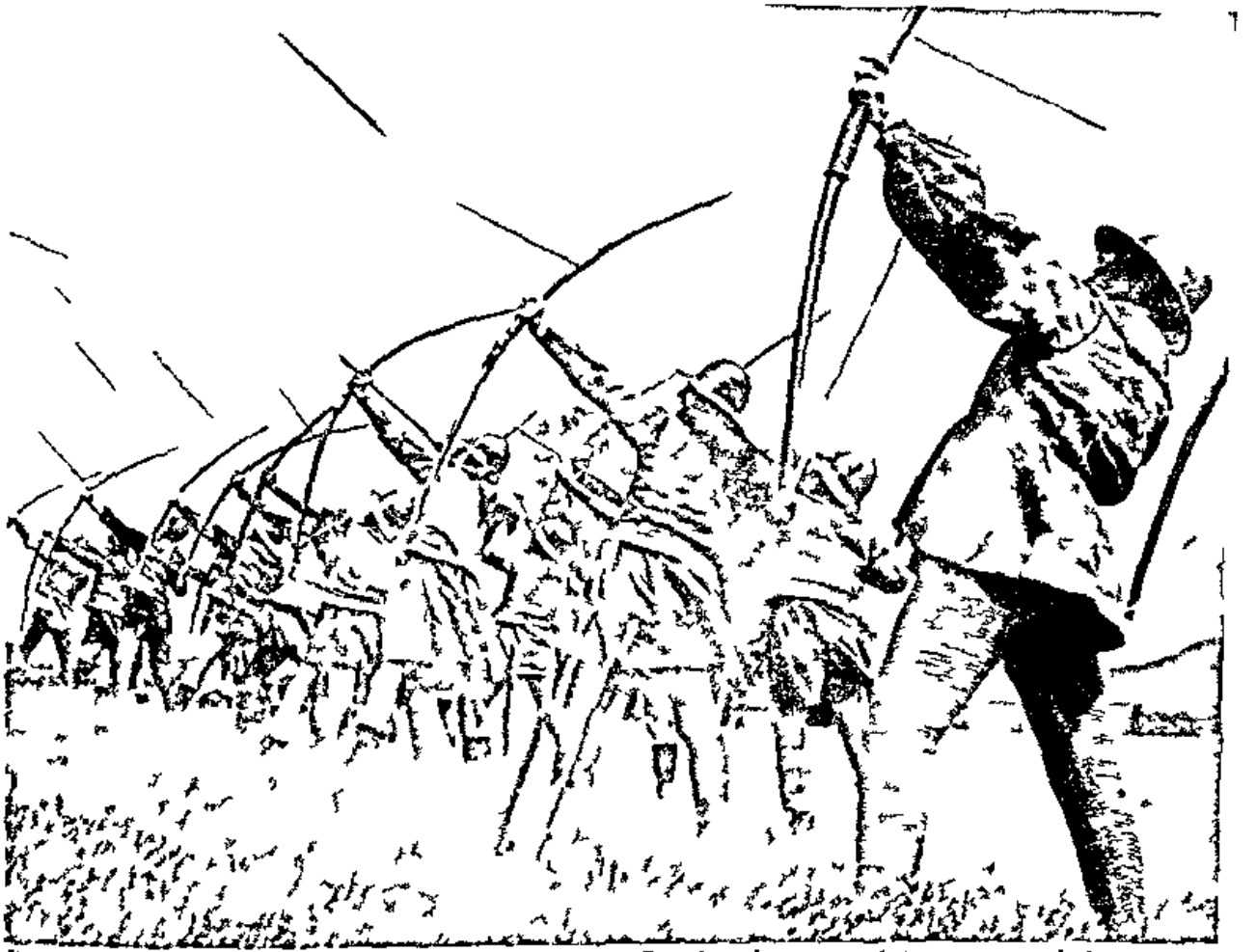
Henry V, 1413–1422—the former madcap "Prince Hal" of Falstaff's companionship in Shakespeare's scenes—proved the hero-king of England. As king he "put away childish things," and was sober, clearheaded, and vigorous, so that he acquired the reputation of being "the most virtuous and prudent of all the princes reigning in his time." He followed his father's advice to "busy giddy minds with foreign quarrels" by putting forth again the claim to the French throne, formerly raised by Edward III, thereby renewing the Hundred Years' War (*see* Hundred Years' War). By his brilliant victory at Agincourt (1415) he conquered all the northern half of France, and by a treaty five years later he married Princess Katherine of France, and it was agreed that he should become king of France also after the death of her father, the insane Charles VI. In the midst of his victories, Henry V died of camp fever, leaving as heir to his rights in both kingdoms his infant son Henry, nine months old.

Henry VI, 1422–1461, was one of the most unfortunate kings who ever sat on a throne. While he was still a baby his uncle, the Duke of Bedford, ruled for him, and for a time maintained and even extended the English conquests on the continent. Then the French were aroused by Joan of Arc, who raised the siege of Orleans and brought the young French king, Charles VII, to Reims to be crowned (*see* Joan of Arc).

Matters did not mend for the English when Henry VI grew to manhood. He was truthful, upright, and just, but he had neither the strength of mind nor of body to rule a kingdom, and for long periods he was insane like his French grandfather. War and business were never to his liking; he would rather have lived the life of a monk. So bit by bit the English lost the lands which they held in France, until only the city of Calais was left to them when the long Hundred Years' War ended, in 1453.

Meantime the misgovernment of Henry's ministers at home led to a rebellion under Jack Cade, in 1450, in which London was taken before the insurgents were overpowered and their leaders executed. Five years later began the bloody and merciless Wars of the Roses. In these Queen Margaret, Henry's French

HENRY V S LONGBOWMEN BEGIN THE BATTLE OF AGINCOURT



He e s a mode n mo on p u e v s on of a u n g p o n n h o y Eng sh ongbowmen a e shoo ng a ows a h gh ang e o ge extreme ange aga nst F en h knigh s and a m ed so d e s who s advan ng n he ba e of Ag n ou The a ows we e effe e The Eng sh won no only he ba e bu no he n F an e s we Th ongbows v ua y end d he c a o med eval a mo and he med e a knigh The scene a om *L e Magas n* z c ew of he p u e Hen y V

wife was the real head of the Lancastrian party and King Henry played only a feeble part But in the course of the contest he lost his throne to the Yorkists his young son Prince Edward was slain and the king himself was murdered in the Tower of London where he had been imprisoned (*See* Roses Wars of the)

The Founder of the Tudor Line

HENRY VII 1485-1509 who claimed descent from the Lancastrian House gained the throne by overthrowing the last of the Yorkists When the battered crown of the usurper Richard III was picked up on Bosworth Field and placed on the head of Henry Tudor this seventh Henry the Wars of the Roses ended and with them the Middle Ages in England He was the first modern king of that land He united the houses of Lancaster and York by marrying Elizabeth of York niece of Richard III War had no place in the policy of this Tudor king who was called the Solomon of England and was regarded as the craftiest and stingiest prince of his time Abroad he secured his aims by treaties and by the marriage alliances of his children At home he increased his power by forbidding the great nobles to maintain lawless bands of followers and by compelling them to obey the laws by means of his famous Court of Star Chamber (*see* Star Chamber) He thus laid the basis of that powerful Tudor monarchy as it came to his son Henry VIII and the great Elizabeth I

Henry VII is also to be remembered because in his time the Renaissance (*see* Renaissance) was established in England William Caxton had introduced printing into England shortly before this and it was John Cabot sailing by permission of Henry VII who laid the foundation for England's claim to Newfoundland and the mainland of North America

HENRY VIII 1509–1547 was educated in the New Learning and—before the death of his elder brother Arthur made him heir to the throne—was intended for the archbishopric of Canterbury He was a gay and handsome youth well skilled in all manner of athletic games though in later life he became coarse fat and ungainly For nearly 40 years he ruled England with a strong hand and brought about one of the most far reaching changes ever effected in the institutions of any kingdom For motives of policy

he was betrothed to his brother's girl widow, Catherine of Aragon. During the first 20 years of his reign he left the shaping of policies largely in the hands of his great counselor, Cardinal Wolsey, who sought to give England importance by acting as an arbiter between warring Spain and France. On one occasion Henry took part in France in the gorgeous display of the "Field of the Cloth of Gold," where he and the young French king, Francis I, met to wrestle, dance, watch tournaments, and talk of international relations and policies.



HENRY VIII
England's Royal Bluebeard

At the end of this period Henry professed doubts as to the power of the Pope to grant him the "dispensation" which the laws of the church had required in order that he might marry his brother's widow. Perhaps these doubts were strengthened by the fact that the only one of Queen Catherine's children to live was a sickly girl—the Princess Mary—and it was doubtful whether a woman could succeed to the English throne. Then, too, Henry had grown tired of Catherine and had fallen in love with a young lady of the court named Anne Boleyn.

When the Pope would not annul his marriage, Henry in furious anger turned against his faithful minister Wolsey, deprived him of his office of Chancellor, and had him arrested on a charge of treason (*see* Wolsey, Cardinal). He then obtained a divorce through Thomas Cranmer, whom he had made Archbishop of Canterbury for the purpose, and it was soon announced that he had married Anne Boleyn. The Pope was thus defied. All ties that bound the English church to Rome were broken. Appeals to the Pope's Court were forbidden; all payments to Rome were stopped; and the Pope's authority in England was abolished. By an act of Parliament, Henry himself was declared "Supreme Head of the Church of England," and to deny this title was made an act of treason. Some changes were also made in the church services, and the Bible translated into English and printed copies placed in the churches. The monasteries throughout England were dissolved and their vast lands and goods turned over to the king, who in turn granted those estates to noblemen who would support his policies. In the northern part of the kingdom the people rose in rebellion in behalf of the monks, but their "Pilgrimage of Grace," as it was called, was put down with bloody cruelty.

Although Henry reformed the government of the church, he refused to allow any changes to be made in its doctrines. Before his divorce he had opposed the teachings of Luther in a book which had gained for him from the Pope the title "Defender of the Faith"—a title the kings of England still bear. And after the separation from Rome he persecuted with equal severity the Catholics who adhered to the government of Rome, and the Protestants who rejected its doctrines.

With equal bloodthirstiness he put to death every possible claimant to his throne. Among other victims whom he sent to the block were two of his wives, for he was married six times. You may perhaps have heard the old jingle:

King Henry the Eighth to six wives was wedded.
One died, one survived,
Two divorced and two beheaded.

Anne Boleyn bore the king one child, who became Elizabeth I. Henry soon tired of Anne and had her put to death. A few days later he married a third wife, Jane Seymour. She died in a little more than a year, after having given birth to the future Edward VI. A marriage was then contracted with a German princess, Anne of Cleves, whom the king had been led to believe to be very beautiful. When he saw her he discovered that he had been tricked; and he promptly divorced this wife and beheaded Thomas Cromwell, the minister who had arranged the marriage. His fifth wife, Catherine Howard, was sent to the block for misconduct. But the sixth one, tactful Catherine Parr, managed to survive this royal Bluebeard and lived to marry her fourth husband.

Henry, Kings of France. Four kings of France have borne the name of Henry, of whom the last was the greatest. Henry I, who ruled 1031–1060, was a contemporary of William the Conqueror, of England, and was defeated by that invincible warrior when he attempted to assert his authority over the duchy of Normandy. Under Henry II (1547–1559) began the religious persecution of the Huguenots, which laid the fuse for the religious wars after his death. He died in a tournament, when a splinter from a lance entered the eye-hole of his helmet and penetrated to his brain; in this, Protestants saw the hand of Providence. The utterly worthless Henry III (1574–1589), the last of the three weak sons of Henry II and Catherine de Medici, was for a brief period

elective king of Poland before he succeeded to the throne of France His death by an assassin s hand in the course of the Huguenot wars opened the succession to his Protestant rival Henry of Navarre

HENRY IV, king of France and Navarre who reigned from 1589 to 1610 was the last and greatest of the Henrys He was king not only of France but also of the small independent kingdom of Navarre on the northern slope of the Pyrenees In 1569 when he was 16 years old, his mother Jeanne d Albret the Huguenot queen of Navarre placed him in the care of Admiral Coligny the brave Huguenot leader (*see* Coligny, Gaspard de) From that time until his accession as king of France Henry of Navarre was the recognized leader of the Huguenot party but for a short time after his marriage to the king s sister, Margaret of Valois, and the subsequent massacre of St Bartholomew's Day, he seemed to renounce the Protestant faith in his tolerant easy going way



HENRY IV

Now glory to the Lord of Hosts from whom all glories are!
And glory to our Sovereign Liege King Henry of Navarre!

At the death of Henry III in 1589 Henry of Navarre was the heir to the throne of France But his right of succession was disputed by the powerful Holy League aided by King Philip II of Spain and he was not crowned until he had enforced his claim by arms and had become a member of the Catholic church The victory was practically won at the battle of Ivry, in 1590 which Macaulay has rendered famous by his poem of that name beginning—

Now glory to the Lord of Hosts from whom all glories are
And glory to our Sovereign Liege King Henry of Navarre!

Henry IV also set about restoring the prosperity of the land My wish ' he said is that every peasant in the kingdom should be able to have a chicken in the pot for his Sunday dinner ' Agriculture and manufacture were encouraged by him and roads repaired so that commerce might be benefited

The improvement in the condition of the people, in which he was aided by his great minister the Duke of Sully, and the agreeable personality of Henry IV the first of the Bourbon kings combined to render him the most popular king France has ever had He was struck down by the dagger of a religious assassin as he was riding through the streets of Paris, leaving the throne to his young son Louis XIII

Although he conformed to the Catholic church *Henry IV did not forget* the claims of his former religious associates The Edict of Nantes which he *issued in 1598* gave the Huguenots equal political rights with Catholics *the right* to reside freely anywhere in France freedom of private worship in their own homes and public worship in certain places (not including the king s court or within five leagues of Paris) and *the* government of La Rochelle and a few other strong places as cities *of refuge* This edict remained in force with some modifications for nearly a hundred years (*see* Louis Kings of *France*)

HENRY, PATRICK (1736–1799) The stirring words of Patrick Henry Give me liberty or give me death furnish the keynote of that famous orator s public career As an agitator and a champion of the common people he had no equal in his day

Patrick Henry was born in east-central Virginia of good Scottish stock and received such education as the scanty opportunities of that vicinity permitted But he was a venturesome and fun loving youth and gave up his studies at the age of 15 to enter business Three times within the next seven years he failed—twice as storekeeper and once as a farmer Convinced that he had no ability in either of these fields he next turned his attention to law Here he found a congenial pursuit for he was a born talker After a few weeks of study, he was admitted to the bar He succeeded immediately as a pleader before frontier juries and his accounts show that during the first three years of practice he collected fees in 1 185 cases

In 1763 Patrick Henry supported the people against the established church in a case known as the ' Parson s Cause During the trial of the case he declared in an impassioned speech that a king by vetoing salutary acts of a colonial legislature degenerates into a tyrant and forfeits all right to his subjects obedience This declaration brought him the love of the colonists and a seat in the Virginia House of Burgesses just at the time of the passage of the Stamp Act in 1765

When the older members of that House hesitated, not knowing what course to take in regard to the Stamp Act, Patrick Henry brought in a series of

resolutions, declaring that the English Parliament had no right to tax the American colonies. In the debate which followed, Henry exclaimed with terrifying boldness: "Caesar had his Brutus; Charles the First, his Cromwell; and George the Third . . . " Here he was interrupted by loud cries of "Treason! Treason!" from members of the House. Pausing for a moment Henry coolly added: "And George the Third may profit by their example. If *this* be treason make the most of it!" This fiery speech secured the adoption of the resolutions. By his fearlessness and his eloquence Patrick Henry had become the spokesman for the colonial cause in the southern colonies, as James Otis and Samuel Adams were in New England.



PATRICK HENRY
The Orator of the Revolution

In 1774 Henry was sent by Virginia as a member of the first Continental Congress, where he declared in ringing tones, "I am not a Virginian, but an *American!*" Next year at the second revolutionary "convention" called in Virginia, he made his most frequently quoted speech, in urging the colony to arm her militia:

"Gentlemen may cry peace! peace!" he said, "but there *is* no peace! The war is actually begun! The next gale that sweeps from the North will bring to our ears the clash of resounding arms! Our brethren are already in the field. Is life so dear, or peace so sweet as to be purchased at the price of chains and slavery? Forbid it, Almighty God! I know not what course others may take; but as for me, give me liberty, or give me death."

No one contributed more to arouse the people of Virginia, and a few months later Henry was appointed commander-in-chief of the Virginia troops. He soon quarreled, however, with the Committee of Public Safety, which acted as the governing body of the colony, and resigned his commission. This was perhaps fortunate, for Henry had greater talents as an agitator than as a military leader.

Patrick Henry also aided in drawing up Virginia's state constitution in 1776, and was elected first governor of the state. He filled this post moderately well and was three times reëlected. It was with a commission from Governor Henry that George Rogers Clark set out to conquer the territory northwest of the Ohio from the British.

Henry Opposes the Constitution

In the Virginia convention of 1788, called to ratify the new constitution of the United States, Patrick Henry bitterly opposed the adoption of the new form of government, which he believed was dangerous to the liberties of the country. He objected to it because it contained no "bill of rights," because it infringed too much on the rights of the States, and because (as he said) it would prove "one great consolidated national government of the people of all the States," instead of a mere confederation. And he asked, "Who authorized them (the framers) to speak the language, *we the people*, instead of, *we the States?*" Fortunately Henry's advice to reject the Constitution was overruled by the wiser counsels of Washington and Madison; but as a result of such opposition the first ten amendments to the Constitution were adopted, known as the "bill of rights."

Henry refused all offices under the new government. In 1799, however, he consented to serve again in the Virginia legislative assembly, but he died before he could take his seat. Long before that event he had become reconciled to the Federal Constitution whose adoption he had so bitterly opposed.

HENRY THE NAVIGATOR (1394–1460). "It is said, Sire," remonstrated the sailor, "that he who crosses the Sea of Darkness will be changed into a black—God's vengeance on his insolent prying; that he will reach the Devil's ocean that boils day and night with fiery heat; and that he will find its hellish coasts fringed with sea monsters, serpent rocks, water-unicorns, and other fearsome creatures!"

Prince Henry of Portugal, that munificent patron of voyagers and explorers and one of the heroes of modern discovery, laughed at his captain's fears. "The sea is as easy to sail in as the waters at home," he told him, "and the land very rich and pleasant Heed not these idle tales; for, by God's help, fame and profit must come from your voyage, if you will but persevere."

Prince Henry did more than any other single person to make the 15th, 16th, and 17th centuries the great Age of Discovery. For 50 years he kept encouraging his countrymen to sail down the west coast of Africa, so that before his death they had pierced through into the unknown South for nearly 2,000 miles.

A Man of Amazing Energy

Henry the Navigator, as he is called in honor of the discoveries he inspired, was the fifth son of John I, king of Portugal, and of Philippa, daughter of the English John of Gaunt. He early distinguished himself at the conquest of Ceuta, the "African Gibraltar," in 1415. Soon afterwards he moved to Sagres, a town close to Cape St. Vincent, where he resided for a great part of his life. While warring against the Moors of Africa, he became greatly interested in this mighty continent, and longed for a better knowledge of the western ocean and the discovery of unknown regions. He founded an observatory and also a school where young men could learn navigation. Then he began sending out expeditions. One by one the rich islands of the Azores, Madeira, the Canaries, and Cape Verde were discovered, and the African coast was explored as far as Sierra Leone. "Explore, trade, convert!" said Prince Henry to his men. All this they did, and—less happily—began trading in captured African slaves.

Prince Henry died before the full results of his work were seen These results, which made people at last realize that the oceans were not great lakes in a world of land were credited to others But the real master of the bold sailors who discovered America, rounded the Cape of Good Hope reached India and finally encircled the globe was Henry the Navigator

HEPATICA Sometimes while wandering among the woods and hills in early spring you come upon little clumps of delicately tinted flowers in fuzzy coats which raise their lovely heads through the old dead forest leaves, like the dainty faces of a bevy of patrician ladies muffled in their furs These are the hepaticas What charm they have these little blossoms of blue, lavender, pink, or white—no two clusters alike in shade or size! Even the gift of fragrance is not entirely denied them, but, in the language of John Burroughs, 'seems as capricious as the gift of genius in families" Sheltered from the frost by their rusty evergreen leaves, and warmed by the late winter sunshine, they bloom even under the snow itself, on shaded hillside or in woodland dell And then, after the blossoms, come the new green leaves —rounded, leathery, and glossy green, sometimes mottled with purple—to replace the last year's weather-worn foliage There are many spring blossoms to follow, but none is fairer than this brave little wilding of the Crowfoot family that heralds the spring from Nova Scotia to Florida and westward to Manitoba, Iowa, and Missouri

Scientific name *Hepatica triloba* The flowers growing singly on slender stems, are about three-quarters of an inch broad and have 6 to 12 petal like sepals enclosed in three fuzzy reddish green leaflets In the center are numerous pistils and anther-bearing stamens There is no corolla the sepals taking the place of ordinary petals The slender hairy stems, springing from the roots are from 4 to 6 inches tall and each bears a flower or leaf The 3 lobed evergreen leaves are thick and liver-shaped whence the name hepatica' (from the Greek meaning liver)

HEPHAESTUS (*he fĕs tŭs*) The lame god Hephaestus (Roman Vulcanus), the son of Zeus and Hera was the god of fire and the forge He was lame from birth, according to some stories, but others assert that he was crippled by being hurled down to earth by Zeus, falling on the island of Lemnos where he built a palace, with a workshop and anvil He also had a beautiful palace in Olympus, or, according to others, under Mount Aetna, on the island of Sicily Here with the help of the Cyclops, the one-eyed giants he made the thunderbolts of Zeus, the armor of Achilles, and the weapons of Hercules He was also aided by handmaidens whom he had made of gold and endowed with life All the palaces of Olympus were built by him In the Homeric poems the kind hearted but limping god is represented as a comic figure whose deformity provokes "inextinguishable laughter' in the other gods He was the patron deity of the metal workers.

HERA (*he ra*) By the side of Zeus on Mount Olympus, as the Greeks believed, reigned his stately wife Hera (called by the Romans Juno), queen of the gods Their life was not always one of harmony, however, for Hera was quick to anger and Zeus frequently gave cause for jealousy Hera was the goddess of womanhood of marriage, and of maternity. The peacock, the cuckoo, and the pomegranate were sacred to her She was usually represented as a beautiful majestic woman of mature age, with large wide-open eyes and grave expression inspiring reverence Homer speaks of her as the 'white-armed goddess' and the "ox-eyed queen" The most famous statue of Hera was the one by Polyclitus in the temple at Argos This was a colossal image, in ivory and gold representing the goddess seated on her throne, wearing a crown and bearing in one hand a pomegranate and in the other a scepter with a cuckoo at the top

HERALDRY In the Middle Ages, when knights wore armor that completely covered their heads and bodies there grew up the custom of emblazoning devices on shields and surcoats so that the wearers could be distinguished By slow degrees an elaborate science of heraldry developed Strict rules were laid down regulating the assumption and design of armorial bearings, and colleges of heralds were founded to enforce observance of the rules Most of the terms used in heraldry are French, because that language prevailed while the science was growing up

Several coats of arms are often arranged or "marshalled on the same shield or 'escutcheon' to show descent, marriage alliance, etc To enable this to be done the shield is divided into halves by a single line extending across it vertically, diagonally, or horizontally, or it is divided into "quarters' by a cross-shaped arrangement of lines, and these quarters may be further subdivided The colors or tinctures' are called *or* (gold), *argent* (silver), *gules* (red), *azure* (blue), *sable* (black), *vert* (green), and *purpure* (purple)

The 'charges" or devices are of infinite variety Some are wide bands variously named according to the direction in which they cross the shield Thus the 'pale' extends from top to bottom, the 'fess' is a horizontal band in the middle, and the 'bend' crosses diagonally from the upper left-hand corner (*dexter chief*) to the lower right-hand corner (*sinister base*) The 'bend sinister, crossing from upper right to lower left, is popularly but erroneously considered a mark of illegitimacy Other common charges are simple geometrical designs and others are conventionalized representations of animals, flowers trees leaves, etc The animal most frequently used is the lion, which may have several positions *rampant* (erect on the hind legs), *passant* (walking), *couchant* (lying with the head raised), *dormant* (asleep), etc

Heraldry gets its name from the heralds of the Middle Ages, who were the official representatives of kings and lords The heralds were also the court chroniclers and it was their duty to keep track of family relationships and of the intricate etiquette governing coats-of-arms

HERBERT, VICTOR (1859–1924). One of America's best-loved composers was a big, hearty Irishman named Victor Herbert. He wrote more than 30 operettas, each filled with delightful, melodious songs. Dozens of them remain popular favorites. 'A Kiss in the Dark', 'Ah, Sweet Mystery of Life', and 'Toyland' are among the Herbert songs that people love to sing and whistle.

VICTOR HERBERT



Wherever people like to sing, Herbert's melodies are still enjoyed.

Herbert himself enjoyed life hugely. He liked gaiety, excitement, and public attention. He worked hard, and he ate and drank heavily. Poor musicians always found him generous with gifts and loans. Herbert was a leader of several Irish-American organizations and was one of the founders of ASCAP (American Society of Composers, Authors, and Publishers).

The composer was born Feb. 1, 1859, in Dublin, Ireland. His father died when Victor was an infant. Victor spent his childhood in the spacious London home of his mother's father, Samuel Lover. When he was seven, his mother took him to Stuttgart, Germany, for his schooling. Victor first learned to play a piccolo, then took up the cello. He entered the Stuttgart music conservatory in 1876, and within a few years he was playing professionally.

In 1883 Herbert became first cellist for the Stuttgart Court Orchestra. He became engaged to Therese Foerster, a young opera singer from Vienna. She accepted a contract from the Metropolitan Opera Company in New York City on condition that they take Herbert as well. He was hired as first cellist. They were married in August 1886, and sailed to New York soon after. At first Therese Herbert's career overshadowed her husband's. But after several years she retired to rear their two children. Meanwhile, Herbert had played first cello under Theodore Thomas and was made assistant to Anton Seidl, both famous conductors. In 1894 he became bandmaster of the Twenty-second Regimental Band. About the same time he wrote his first operetta, 'Prince Ananias'.

Herbert conducted the Pittsburgh Symphony Orchestra for six years (1898–1904), then returned to New York City to form his own orchestra. He continued to write operettas, sometimes several a year. He also wrote many works for choral groups and orchestra. Among his most successful operettas were 'Babes in Toyland', 'Mlle. Modiste', 'Naughty Marietta', 'The Red Mill', and 'Sweethearts'. But Herbert could never find a writer who could prepare text to match his music. His two serious operas failed largely because of poor plots. He died May 26, 1924.

HERCULES (*hĕr'kū-lēz*). The most celebrated of all the Greek heroes was the mighty and great-hearted Hercules. (The Greeks called him Heracles.) He was the son of the god Zeus and the mortal Alcmene. The goddess Hera (Juno) hated Hercules from his birth and sent two serpents to destroy him in his cradle. But the infant strangled them. The boy Hercules was trained in manly accomplishments by the centaur Chiron and other heroes.

When Hercules was a young man, two beautiful maidens came to him. One was Arete (virtue); the other, Kakia (vice). Kakia offered him ease, pleasure, and riches if he would follow her. Arete offered him only glory for a lifelong struggle against evil. Hercules chose to be guided by Arete.

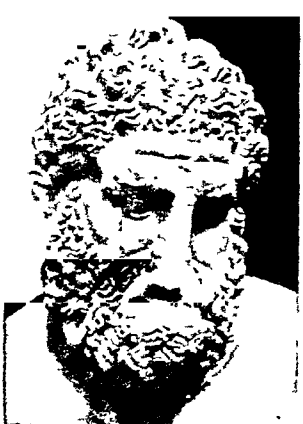
Twelve Labors Performed by Hercules

In a fit of frenzy caused by Hera, Hercules slew his own children. To atone, he was forced to serve his cousin King Eurystheus. He was compelled to perform the great tasks known as the "twelve labors."

The first labor was the slaying of the Nemean lion. Hercules strangled the animal and wore the lion's skin as a garment. Next he slew the Hydra, a terrible nine-headed water serpent. His third task was the capture of the wild Erymanthian boar. The capture of the Ceryneian stag, an animal with golden horns and brazen hoofs, was the fourth labor.

The fifth labor was to kill the Stymphalian birds, which fed on human flesh. The sixth was to clean the Augean stables that held a herd of 3,000 oxen. Their stalls had not been cleaned for 30 years. Hercules turned two rivers, the Alpheus and the Peneus, through the stables and finished the work in a single day. As his seventh labor he captured the Cretan bull. Next came the capture of the flesh-eating wild mares of Diomedes, king of Thrace. Hercules killed Diomedes and threw his body to the horses. He then had to obtain the belt of Hippolyta, queen of the Amazons. He defeated her warrior-women, killed the queen, and escaped with the belt. The tenth labor was to capture the oxen of Geryon, which dwelt on the fabled island Erytheia beyond the Strait of Gibraltar. On his way Hercules erected the rocks on either side of the strait (the Pillars of Hercules). His eleventh task was to bring Cerberus, the many-headed dog who guarded the gates of Hades, up from the underworld. Hercules brought the dog before Eurystheus. The king was so terrified that Hercules had to return the

HERCULES



This majestic head is from a statue in the British Museum, London.

monster to Hades Finally he had to obtain some golden apples guarded by four sister nymphs called the Hesperides Their father Atlas had to hold up the heavens but Hercules did this for him while Atlas took the apples

Hercules was now free but he performed other feats At length the centaur Nessus tried to carry off Her cules wife Deianira Hercules shot Nessus with a poisoned arrow The dying centaur had Deianira keep some of his blood as a love charm Soon Hercules fell in love with another maiden and Deianira sent him a robe steeped in the blood When Hercules put it on poison spread through his body like fire He fled to Mount Oeta built a funeral fire and threw himself on it to die

Hercules heroic strength has inspired many works of art The finest representation in sculpture is the so-called Farnese Hercules in the National Museum at Naples It is a copy of an earlier work by the ancient sculptor Lysippus

How HEREDITY WORKS *to Pass On* TRAITS

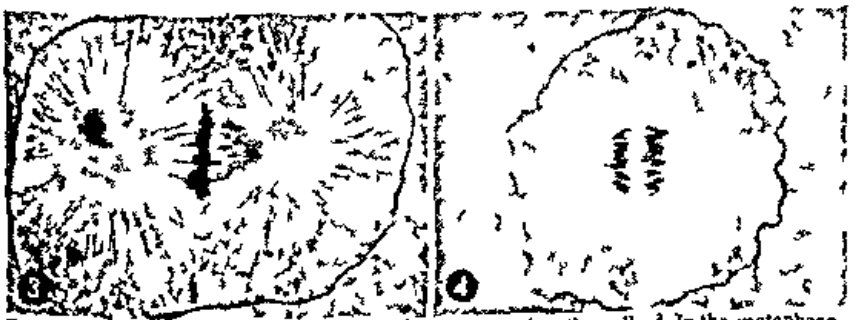
HEREDITY As everyone knows children often resemble their parents A boy for example may be tall or broad shouldered like his father while a girl may have her mother's wavy hair Children of blonds usually are blond and blue-eyed parents are almost sure to have blue-eyed sons or daughters

These resemblances are brought about by *heredity* the process which passes on traits or characters from parents to their offspring Besides making most children look like their fathers or mothers heredity gives all of us the characters of body and mind that make us human beings Heredity also determines that hens eggs shall develop into chicks that acorns shall become oak trees and so on for all living things

THE SIMPLEST TRANSMISSION OF CHARACTERISTICS



Heredity is generally taken to mean the transmission of characters from one generation to the next But transmission also occurs when a cell divides by mitosis First granular material chromatin which determines hereditary characters forms a long thread and centers of action (asters) appear 1 As this beginning stage or prophase continues the thread breaks into sections called chromosomes 2 At the end of the prophase chromosomes are linked to the asters on either side by fibers of the *spindle*



These pictures show the first steps in actual division within the *cell*. 3 *In the metaphase*, the chromosomes form a flat plate which we see edgewise It lies at the middle of the spindle whose fibers now show plainly Each chromosome also is divided into two lengthwise halves 4 In the following anaphase, the divided chromosomes *are pulled apart* by the spindle fibers so that one set of chromosomes can go into each new cell



Division is completed in the telophase 5 The two sets of divided chromosomes are drawn to their respective asters and the spindle begins to disappear The cell membrane also pinches between the asters 6 The membrane has pinched so much that the cell soon will be divided and the chromosomes are *beginning to go to pieces*

While plants and animals usually breed true the workings of heredity may also bring hidden characters to light and arrange old ones in new combinations Thus it explains why brunette parents sometimes have red haired children and why the seeds from pink four-o clocks become plants with pink red and white flowers

Heredity Has Been a Puzzle

People have known about heredity for ages and have made many unsuccessful efforts to explain it Some said that heredity was carried by blood and we still hear the word *blood* used to mean race or ancestry Others thought that tiny creatures appeared ready made in the reproductive cells of man and some other animals and grew to full size at the appropriate time

Several attempts were made to explain heredity as a transmittal of effects produced by use and disuse Supposedly these life experiences caused some organs to grow larger and stronger but allowed others to dwindle away and the changes were passed on to later generations

All such explanations failed when biologists proved that such

characters could not be passed on from one generation to the next. The same fate met attempts to explain the inheritance of changes produced by climate, food, and other external factors.

The subject of heredity was brought to worldwide attention when Charles Darwin announced his theories of evolution in 1859. Though Darwin did not explain *how* inheritance takes place, he did declare that *variations* which were transmitted could account for all the forms of plant and animal life, living and extinct, on the earth (*see* Darwin; Evolution).

About this time an English anthropologist, Francis Galton, began to study heredity in human beings. He established many facts about the inheritance of traits such as color blindness. A German biologist, August Weismann, showed that heredity commonly depends upon special material called *germ plasm*, which is more complex than other living material.

Mendel's Experiments with Peas

Most biologists consider, however, that the modern science of heredity rests upon the work of Gregor Mendel, an Augustinian monk who became abbot of a monastery at Brünn (now Brno, in Czechoslovakia). From 1854 to 1863 Father Mendel bred peas in the garden of the monastery. He began by selecting varieties that differed in pairs of contrasting characters such as tall or short vines, red flowers or white ones, and seeds that were green or yellow. (Such contrasting characters are called *allelomorphs*.) He also made sure that his peas were "pure" for each character. This meant that no traces of the opposite character were hidden away in their hereditary make-up, to appear at a later time and spoil his experiments.

Having done this, Mendel crossed peas which differed in one set of characters, such as the color of the flowers. At that time people thought that such characters blended to produce offspring of an intermediate type. The crossbred offspring (*hybrids*) of red and white peas, however, were not pink. They were all red. All members of this first generation of hybrids (the F_1 generation, as Mendel called it) resembled only one of their parents. The same was true of other pairs of opposite characters which Mendel combined in separate experiments.

The missing character had not vanished, however, as he found when he interbred the hybrid peas. In the next (F_2) generation, three fourths of the plants had red flowers and one fourth had the white flowers which had been missing in the F_1 generation. Actually there were three kinds of peas among his F_2 plants. Mendel discovered this when he bred still another (F_3) generation.

His breeding records for the F_3 generation showed that one fourth of the F_2 generation had been "pure" for white and produced only white offspring. One fourth had been pure for red and produced all red offspring. The remaining two fourths, or one half, proved to have both red and white in their hereditary make-up. Like the F_1 generation, they were red-colored hybrids, and they produced red and white offspring in the ratio of 3 to 1.

Finally Mendel crossbred peas that differed in two and three pairs of characters. For example, he crossed peas having smooth yellow seeds with others that were wrinkled and green. All the F_1 hybrids then had smooth yellow seeds. But all four characters reappeared in the F_2 generation. The combinations were smooth yellow, smooth green, wrinkled yellow, and wrinkled green, with ratios of 9:3:3:1.

Mendel's Great Discoveries

Father Mendel published an account of his work in 1866. At that time, however, biologists were deeply stirred by Darwin's theory of evolution. They did not realize the importance of these detailed experiments with peas. When Mendel's report was rediscovered in 1900, biologists found that he had made four important discoveries:

1. Many characters (or the things that produce them) are inherited as separate units. These do not mix, even in hybrid organisms. The character-producing units may also seem to disappear and still not be lost. This happened in Mendel's F_1 generation of peas.

2. Different characters may separate and then combine in various ways when hybrids interbreed. When Mendel crossbred smooth yellow and wrinkled green peas, for example, the hybrids produced an F_2 generation containing these characters in four different combinations.

3. When organisms with contrasting characters mate, one character may hide the other in the mixed, or hybrid, offspring. The hereditary factor that makes pea flowers red, hides or *dominates* the one for whiteness. Mendel described the hidden characteristic as *recessive*. Even when dominance is not complete it explains many supposed irregularities in heredity.

4. The most important discovery was one which Mendel did not state clearly. This was the fact that heredity is an orderly process, capable of producing results with almost mathematical precision. This meant that scientists could study inheritance of characters experimentally. They did not have to rely only upon observation and speculation as they had in the past. Thus biologists who applied Mendel's principles and methods were able to build up *genetics*, the science of heredity.

Heredity Granules and Chromosomes

Mendel explained his discoveries by supposing that tiny grains or granules control hereditary characters. One granule, he said, produced yellow peas; the opposite granule made them green. Other granules caused plants to become tall or short, made flowers red or white, and so on. In scientific terms, Mendel believed that each kind of granule *determined* one or the other characteristic.

Granules like those which Mendel described are found in members of the moneran kingdom, which includes the simplest of all living things (*see* Life). Both bacteria and blue-green algae contain tiny bits of material known as *chromatin* (a term that means "colored substance," because it can be stained by certain dyes). When monerans reproduce, their chromatin gathers in structures called chromosomes, which

How Garden Peas Demonstrate Mendel's Law

Color of Flowers

Pure Strains — Red flowers

White flowers

Hybrids (Crossed red and white)

Heredity Color Carriers

Carriers Red White

Hybrid carriers

Flower color Red White

Pure Strains

Red flowers		White flowers	Red flowers		White flowers
Parents	Parents			Parents	
Offspring	Offspring			Offspring	

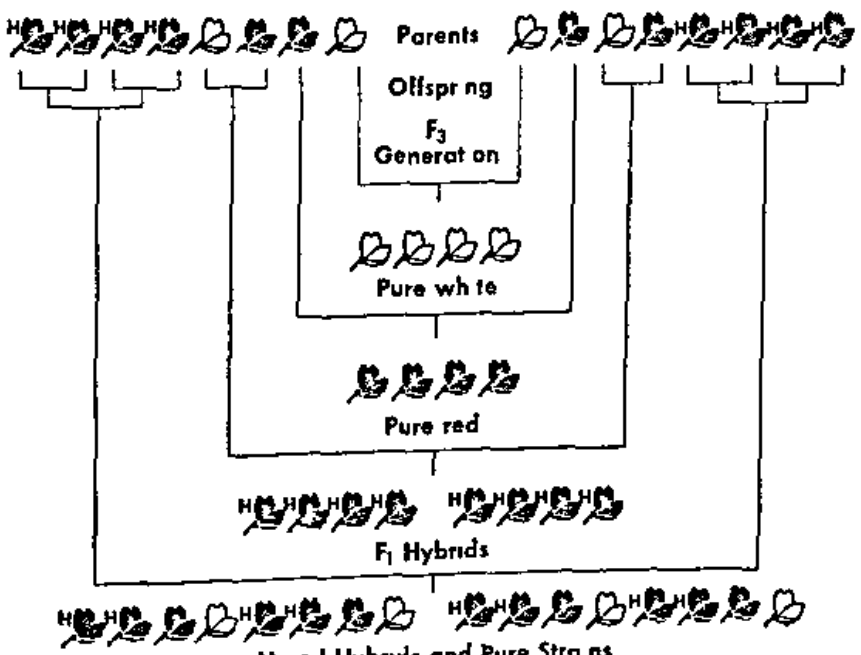
Results of Crossing Red and White

Parents	Mendel's Generations (F_1 F_2 F_3)	Parents
Offspring (Hybrids)	F_1 Generation	Offspring (Hybrids)

Results of Mating Hybrids

Parents		Parents
Offspring	F_2 Generation	Offspring

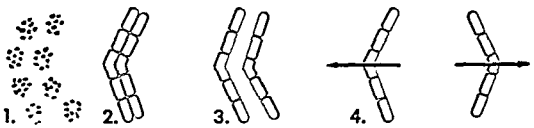
Results of Mating the F_2 Generation



This page shows how various characteristics such as red and white blossoms in garden peas are passed on from generation to generation. Four generations are shown starting with pure strains of red and white. The hybrid or crossbred flowers (marked H) show how the *dominant* red trait masks the *recessive* white as explained in the article. The *symbols* at the upper right show how carriers in the sex cells of the flowers transmit the color tendencies and combine to produce the various results shown. These carriers were called *genes* before scientists knew anything about their nature. Today scientists have found that the genes are carried in cell structures called *chromosomes* as explained in the article

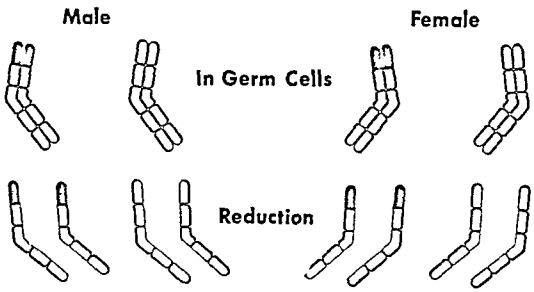
How Characters Are Passed On

Chromosomes in Simple Cell Division



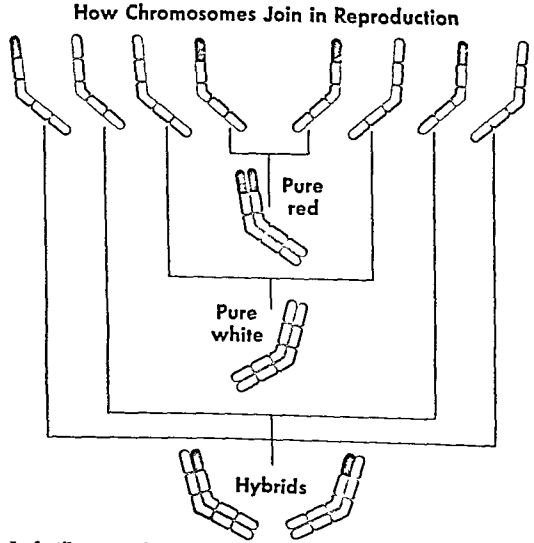
1. At the start of a simple "mitotic" division of one body cell into two, every cell has scattered granules of chromatin These contain the determiners (called "genes") of inherited characteristics 2 The granules organize, like beads on a string, into "chromosomes" Then each chromosome (and each gene in it) prepares to split lengthwise into a pair of chromosomes with genes (For simplicity, only one such chromosome with five sections is shown) 3 The divided chromosomes pull apart within the cell 4 Finally the cell divides, and each new cell has its chromosome

Chromosomes in Sexual Reproduction



Sex cells arise from germ cells which contain paired chromosomes In body cells, chromosomes must be paired in this way to be effective The upper row of diagrams shows these chromosomes, with corresponding segments that carry the gene for red or white flowers as they do in pure strains Complex division produces mature sex cells with only one chromosome (lower row) This is called "reduction" These cells produce a new individual when corresponding chromosomes from each sex are joined in pairs

How Chromosomes Join in Reproduction



In fertilization, the genes for red and white flowers (whichever are present) match up by chance (For simplicity, they are shown at the top of each chromosome) In a large number of mixed matings, the matchings will average one red-red, one white-white, and two red-white, as in Mendel's F_2 generation

then divide lengthwise into identical halves One set of halves goes into each new moneran, thereby transmitting the characters of the parent

Monerans are so simple that their chromosomes seem to be scattered through the cell. In more complex organisms these structures are kept in a flattened or ball-shaped nucleus which is the living center of the whole highly organized cell.

Chromosomes range in shape from lumps to bead-like chains or structures bent like the letter V. While cells are growing or "resting," chromosomes break down into granules which are scattered through the nucleus To prepare for cell division, the granules again form chromosomes, and these split lengthwise, forming two similar sets. These sets then are pulled apart while the old cell divides into two. Each new cell gets a set of the split chromosomes.

Mitosis and Sexual Reproduction

This simple sort of division is called *mitosis*. It occurs when body (or *somatic*) cells of larger plants and animals form two new cells of the same kind One-celled creatures such as the amoeba employ it for reproduction (*see* Amoeba). In either case, the new cells have the same number of chromosomes as the old one, and a certain number is characteristic of each species Cells in houseflies, for example, have 12, garden peas have 14; and earthworms have 32 A horse's cells contain 60 chromosomes, and those in one species of crayfish number 200. The cells of a human being have 48 chromosomes

Most complex (many-celled) plants and animals reproduce *sexually*. This means that the body, or somatic, cells can only divide into others of the same kind. A *new* individual can only be produced by union of sex cells, formed by special organs in male and female parents. The male cell is called a *sperm*, and the female cell an *egg* or *ovum*.

These cells also contain chromosomes, which divide and reunite during reproduction, in a special way It was easy to guess that the chromosomes were hereditary carriers; and in the course of years, many biologists contributed proofs that this is the case. Perhaps the most extensive proof was offered, beginning in 1910, by the American Thomas H. Morgan and his many pupils and associates from experiments with the fruit fly, *Drosophila melanogaster*.

Drosophila (pronounced *drŏ-sŏf'ĭ-la*) was an ideal organism for the purpose. The life cycle, from egg to egg, may take only ten days. This makes for speedy study Study was simplified because the cells have only four chromosomes, and in certain organs these can be seen in so-called "giant" size. Finally, *Drosophila* can be made to show many variations, such as eye color and wing shape.

Chromosome Changes during Reproduction

In higher plants and animals, chromosomes exist in pairs For example, the 48 chromosomes in a human body cell are in 24 pairs. This paired arrangement seems necessary if the cell is to live and function

The germ cells which give rise to sperm and eggs also have paired chromosomes. Mature sex cells, ready

for reproduction, are produced by a series of changes which leave only one chromosome from each pair When an egg and a sperm unite, thereby *fertilizing* the *egg the single chromosomes join to form similar pairs* These make the proper number for the species

Geneticists also learned how the sex of a new individual is determined when they found that *certain* female insects have one more chromosome than the males It was relatively easy to show that this extra chromosome, called X, determined the inheritance of several characters found only in the female bugs

Later discoveries revealed plants and animals in which the female has two X chromosomes while the male has only X and a smaller chromosome called Y In still others the male has two Xs and the female X and Y The sex of a new individual is determined by the presence or absence of an X chromosome or by whether an X chromosome combines with another X or with a Y in the fertilized cell which gives rise to the new animal or plant

Identification of Genes in Chromosomes

Countless studies made in the light of Mendel's findings proved that a new individual's inheritance is made up of thousands of traits or characteristics Some are inherited in groups, others are transmitted *more or less independently of any others For convenience* in analyzing the facts biologists called the carrier of each trait, whatever the carrier might be, a *gene*

Since thousands of traits are inherited, there must be many more genes than there are chromosomes But microscopic examination shows that chromosomes are chainlike arrays of knots or disks These may be genes or groups of closely linked genes The actual nature of the genes, or determining factors, is another question Most biologists believe that the knots produce hormonelike compounds which circulate through the growing body of the new individual and produce whatever trait or traits the gene or genes in the knot may control

Complex Types of Heredity

The various combinations shown *in diagrams* earlier in this article occur with almost mathematical precision, according to how the genes happen to combine In the *case of many traits, however,* the transmission is much more complex A few cases even depend upon genes that act in groups or in combination with other factors, some of which are not inherited

Among human beings for example several pairs of dominant genes produce the dark skin of a Negro while the same number of recessive genes determines the pale skin of a white When all the genes are of one kind the skin color is pure, but when whites and Negroes intermarry, the F_2 and later generations produce many different degrees of color

Scientists once were puzzled by the fact that a yellowish variety of mouse never "breeds true" or *is pure, for this character Then they found* that the genes for yellow hair cause death if two of them are present Many similar "killer," or *lethal*, genes have been found *in other animals* and plants

GIANT CHROMOSOMES IN THE FRUIT FLY



This photomicrograph shows chromosomes from a salivary gland of a fruit fly larva The chromosomes are of so-called 'giant' size They show clearly how each chromosome has many disks or knots along it These segments supposedly supply the genes which control heredity, as told in the article

Many genes depend upon conditions inside plants and animals or around them Everyone knows that *cold or lack of water stunts the growth of plants,* no matter what genes for size they have inherited. Disease makes some pigs become runts, though their healthy brother and sister pigs develop into big fat animals A defect inherited by both mice and human beings causes the pituitary gland to stop producing a substance needed for growth (*see* Hormones). Growth therefore ceases, and the mouse or man becomes a midget in spite of its genes for size

Heredity in Human Beings

Human beings have many thousands of genes in 24 pairs of chromosomes Many of the genes give simple Mendelian heredity Some examples follow

SIMPLE MENDELIAN TRAITS IN MAN

Dominant	Recessive
Ordinary	
Curly hair	Straight hair
Dark hair	Blond hair
Tanning of skin	Lack of tanning
Brown eyes	Blue eyes
Prominent chin	Ordinary chin
Unattached ear lobes	Attached ear lobes
Sex-linked	
Normal color vision	Common color blindness
Clotting of blood	Nonclotting or "bleeding"

Contrasting genes determine sex, for two X chromosomes produce a girl baby *while an X and a Y make a* boy Traits other than sex are also controlled by these chromosomes and since these traits go with the sex *heritage they are called sex-linked* The Y chromosome is so small that it contains few genes, but the X contains genes for sex-linked characters such as baldness and common color blindness

The small size of the human Y chromosome explains why recessive sex linked characters appear in men more often than they do in women In the case of many such traits a man gets only one gene, instead of two, in each pair If the gene happens to be recessive, that character will appear, for there cannot be a

dominant gene to mask it. Women, however, must receive two recessive genes before the recessive trait can develop.

Many defects and diseases also are hereditary. Defects range from inability to tan, which causes sunburn, to drooping eyelids, cataract, weakness or partial destruction of muscles, and paralysis. Among the hereditary diseases are two kinds of anemia, allergy, diabetes, and several types of cancer. A tendency to be affected by other types of cancer, or *susceptibility* to them, also seems to be inherited.

Hereditary cataract of the eye, which may lead to blindness, is caused by dominant genes; but their action may be prevented by other genes or by conditions in the body. Inheritance of baldness is even more complicated. The sex-linked factor in baldness depends upon hormones produced by glands; but the *pattern* of baldness seems to be controlled by another group of genes. These have no effect at all when baldness genes or hormones are missing.

Feeble-mindedness and four types of idiocy prove that mental characters can be inherited. It is much harder to show that good mental qualities also are hereditary. And yet in some families talent and high intelligence have "run" for several generations and even for centuries. This suggests that genes may determine good mental qualities as well as poor ones, though training, good health, and other factors also play their part.

How Genes and Characters Change

Although apparent suppression and reappearance of many traits can be explained by dominant and recessive genes, plants and animals occasionally show entirely new characteristics, not present anywhere among the ancestors. Such changes in heredity are called *mutations*. There are three general types:

1. *Chromosome mutations* involve changes in the number of chromosomes. Sometimes one or two are lost; sometimes they are duplicated. In sexual reproduction each new organism should have twice the normal, or *haploid*, number of chromosomes found in reproductive cells, and therefore is *diploid*. But one reproductive cell may keep all its original chromosomes; when it combines with another that is normal, the new cell receives three times the haploid number of chromosomes, or is *triploid*. Cells may also receive two full (diploid) sets of chromosomes, and therefore are *tetraploid*.

2. A class of mutations that has no accepted name is caused by changes in the number or arrangement of genes inside chromosomes. Pairs of chromosomes often twist and exchange sections, so that genes which started out in one, end up in the other. This is called *crossing over*. Genes may also be lost or duplicated, or sections of chromosomes may be reversed, placing genes in the opposite of their normal order.

3. *Gene mutations* come from changes in the structure or materials of genes. Each gene seems to be a complex protein molecule containing thousands upon thousands of atoms, all arranged on a particular plan. Any change is almost sure to modify the character the gene produces in a growing organism. This modification then is passed on to later generations.

Gene mutations have been produced by heat, cold, chemicals, X-rays, and other forms of radiation, including rays from atom bombs. No one knows just how the first three act, but radiation apparently disturbs the balance of atoms inside genes, thus producing mutations. Radiation also breaks living material into electrically charged particles called ions which may recombine in new arrangements or may wander into molecules such as genes. There they have almost the same effect as radiation itself.

Many mutations that appear in experiments with plants, animals, and monerans are harmful, but others are valuable. The same is true of mutations that appear in wild organisms. Most biologists therefore believe that mutations have provided the countless hereditary characters that have led to evolution (*see* Evolution). The process of natural selection, as set forth by Darwin, eliminates harmful mutations and preserves advantageous ones. (This theory is commonly known as "the survival of the fittest.")

The causes of natural mutations also may resemble those in experiments. Some natural mutations seem to have been caused by heat and great cold. Others probably are produced by cosmic rays that come to our earth from other parts of the universe. Some experts believe that all the natural mutations now occurring in man are caused by cosmic radiation.

HER'MES. "A schemer subtle beyond all belief" was the Greek god Hermes, also called Mercurius (Mercury) by the Romans. He was the son of Zeus and Maia, daughter of Atlas. He began his career by escaping from his cradle, when a few hours old, and going out in search of adventures. Finding a tortoise, he took the shell and stretched cords across it, thus inventing the lyre. That same evening he stole the oxen of Apollo, god of the sun, hid them in a cave, and killed two of the oxen. When Apollo discovered the theft, Hermes charmed him by playing on the lyre, and Apollo allowed the little rogue to go unpunished. Hermes gave his lyre to Apollo and received in return a magic wand, called the *caduceus*, which bestowed wealth and prosperity and turned everything it touched into gold.

Hermes was made the messenger of the gods, and one of his many duties was to conduct the shades of the dead to the lower world. Among men he became the patron of merchants, the god of eloquence, of good fortune, of prudence and cunning, of fraud and theft. He was also regarded as the god of the roads and the protector of travelers. Pillars with his image at the top were erected as guideposts.

Hermes was represented most commonly as a slender youth, wearing a broad-brimmed hat adorned with two small wings, and carrying the caduceus in his hand. On his sandals were wings that bore him over land and sea with the swiftness of the wind. Of the statues that have come down from antiquity, the most famous is one thought to be by Praxiteles. It represents Hermes carrying the infant Dionysus.

HERO AND LEANDER The imperishable story of Hero priestess of Aphrodite and Leander the stalwart lover who nightly swam the Hellespont to meet her, stands in literature as one of the supreme examples of ill fated love According to the story as told by various Greek and Roman poets (notably Musaeus) Hero used to place a lamp at the top of her lonely tower at Sestos each night to guide her lover Venturing from Abydos one stormy night he was drowned and his body was washed up on the shore Seeing his lifeless form Hero plunged into the water that she might join him in death The English poet Byron who himself swam the Hellespont refers to the tale in the well known lines

The winds are high
on Helle's wave
As on that night
of stormy water
When love who sent
forgot to save
The young the beautiful
the brave
The lonely hope
of Sestos daughter

HEROD The Herod family began its reign with Herod the Great, who was appointed king of Judea by the Roman Senate in 40 B C On his death in 4 B C, his son Herod Antipas was made ruler of Galilee It was to him that Jesus was sent by Pontius Pilate

Herod Antipas cast aside his first wife to marry the wife of his brother When John the Baptist denounced this marriage Herod had him thrown into prison. On Herod's birthday his stepdaughter Salome danced before him and his guests and pleased him so much that he told her she might ask for anything she wished—even to the half of his kingdom. The girl went to her mother and said What shall I ask? Her mother replied The head of John the Baptist ' So Salome returned to the king and said, ' Give me here John the Baptist's head in a charger" (a large plate) Herod immediately gave the order for the execution and the head was brought to her Several operas have been based on this story, which has also been a favorite subject with painters

HERODOTUS (about 484–425 B C) The Father of History as Herodotus is called was born at Halicarnassus, a Greek colony on the shores of Asia Minor He early devoted himself to a literary life and traveled extensively visiting the shores of the Hellespont and the Black Sea (Euxine) as well as Scythia Syria, Palestine Babylon Egypt and the northern part of Africa He investigated both the customs and religion of the peoples and the history of the countries through which he passed He made use of the material which he gathered in his great work—the first specifically historical work ever written The special purpose of Herodotus work which consists of nine books is to give an account of the conflict between the Greeks and the Persians whose history and enmity Herodotus traces back to mythical times Incidentally it is a treasure-store for the early history of all the lands about the eastern Mediterranean Many of the details of the stories told in his fascinating volumes have been proved incorrect by archeologists and later historians But considering the difficulties under which Herodotus gathered his information his reports are amazingly accurate and reveal a keen understanding of human nature

ALERT AND MOTIONLESS

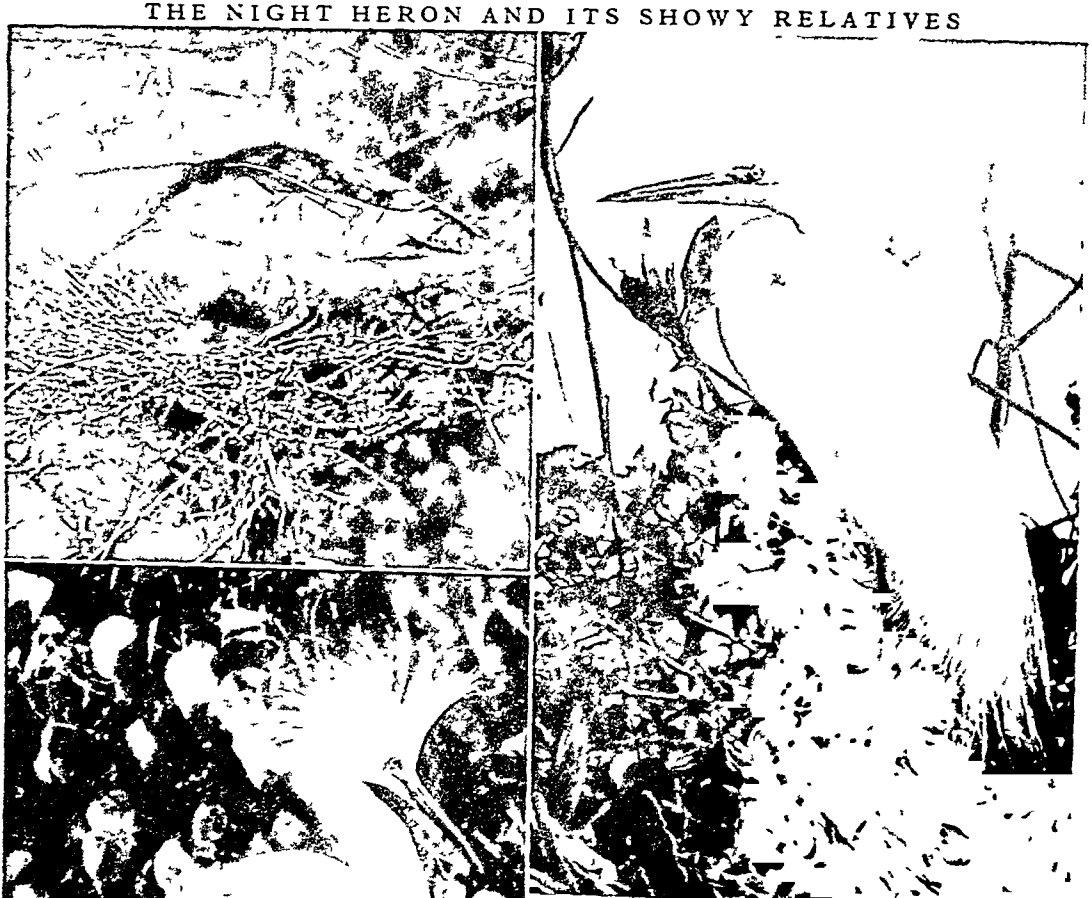


Alarmed by the photographer the great blue heron stands guard over the one fuzzy youngster left in the big rough nest of sticks

HERONS Stilt-walkers is a term that describes these wading and marsh dwelling birds Balanced on long slender legs they are able to step daintily through the mud of the swamp and yet keep their beautiful plumage immaculate The aristocrats of the family are the lovely egrets Herons may be found in virtually all parts of North America except the arctic regions They range in size from the small green heron to the great blue and the great white herons Egrets are now rare since they were slaughtered extensively for their beautiful plumes

The herons and egrets live on the shores of salt-water lagoons fresh water lakes and rivers Although solitary in their feeding habits, they nest

THE NIGHT HERON AND ITS SHOWY RELATIVES



The black-crowned night heron (upper left) wears a plain coat of black and white. But its male cousins, the American egret (upper right) and the snowy egret (lower left), display exquisite plumes during the breeding season.

and roost in flocks. A hundred or more birds often frequent a single nesting site, or heronry. Their nests are crude platforms of sticks placed usually in trees. The eggs number 3 to 6, and are white or blu-ish-green. The young are born covered with down and are reared in the nest. Unlike cranes, with which they are often confused, herons and egrets fly with necks curved back so the head lies between the shoulders. They have thin bodies and necks, straight narrow beaks, and large blunt wings. During the breeding season most herons and all egrets have elongated plumes growing from the head, neck, back, and breast.

Herons and egrets belong to the family *Ardeidæ*, which includes also the bitterns (*see* Bitterns).

The Herons of America

The great blue heron (*Ardea herodias*) ranges throughout the United States. It is about 45 inches long. Its plumage is slaty blue on the back, wing-coverts, and tail, with streaked black-and-white underparts. A long black crest grows from the back of the head. (For illustration in colors, *see* Birds). This bird is a skillful fisherman. It stands statue-like in the water, until its keen eyes discover a fish swimming by. Then, at exactly the right instant, with one sudden stroke of the bill the bird seizes its prey. Sometimes it stalks slowly through the shallow water, lifting each foot clear and setting it down again so gently that no ripple warns the fish or frog.

The green heron (*Butorides virescens*) is common in the eastern United States. A sub-species, Anthony's green heron, lives on the Pacific coast. This bird is

only 18 inches long It has a black crown reddish brown neck, green back and wings and grayish under parts with dark streaks Unlike most herons it is a solitary bird It has a curious trick of freezing When it is startled it will fly to a perch and become absolutely rigid, with head and neck pointing skyward in line with the body This posture combined with the streaked breast and dark back enables the bird to blend into the foliage and escape detection

The great white heron (*Ardea occidentalis*) 48 to 54 inches long, has pure white plumage It frequents southern Florida and the Florida Keys where it nests in the mangrove swamps

The black crowned night heron (*Nycticorax nycticorax*) one of the commonest of herons breeds throughout the United States It is two feet long The crown and upper back are black the lower back wings and tail ashy gray Less common is the yellow crowned night heron (*Nyctanassa violacea*) which has a more southerly range The little blue heron (*Florida caerulea*) and the Louisiana heron (*Hydranassa tricolor*) are common in the southern states from North Carolina to central Texas

The Lovely Egret

The most beautiful birds of the heron family are the egrets represented in the United States by three species The American egret (*Casmerodius albus*) is a white bird 41 inches long not to be confused with the larger great white heron It breeds in Oregon and California and from central Illinois and New Jersey southward During the nesting season it wears a magnificent train of about 50 straight aigrette plumes that grow from between the shoulder blades and reach beyond the tail Even more gorgeous is the nuptial dress of the smaller snowy egret (*Egretta thula*), which breeds along the coast from North Carolina to Louisiana and Texas The rare reddish egret (*Dichromanassa rufescens*) breeds along the Gulf coast

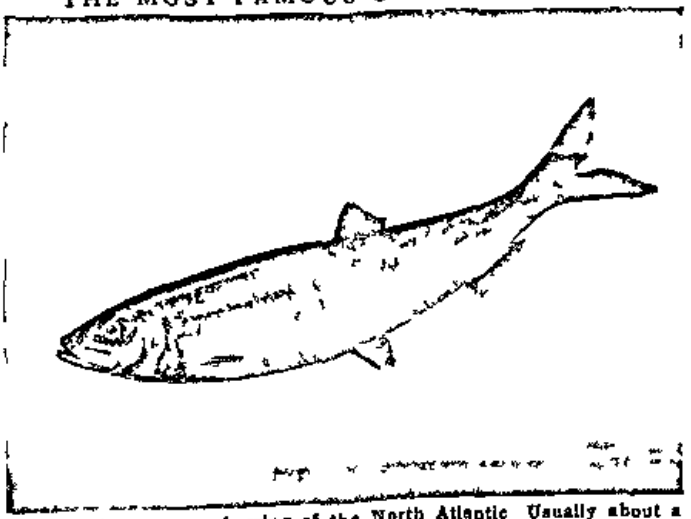
To the egrets beauty proved a curse for women wanted their distinctive feathers for adornment The plumes develop early in the season But since the killing of one bird then might rout the entire colony the plume hunters waited until the eggs were hatched Then the adult birds were slaughtered leaving the fledglings to starve These lovely birds once found by the tens of thousands, were almost exterminated Thanks to the Audubon societies, which obtained and enforced protective laws, they are again on the increase

HERRING Economically the herring family (*Clupeidae*) is the most important of all the families of fishes In addition to the common herring it includes the shad alewife pilchard sardine and menhaden (see Alewife Pilchard)

The common herring (*Clupea harengus*) is of immense value as a food fish It is used fresh canned smoked or salted A favorite preparation is the partly smoked form of bloaters Great quantities of young herring are canned and sold as sardines

Herring are found in incredible numbers in the North Sea the north Atlantic and the seas north of Asia They swim in closely packed schools often covering areas of from 6 to 20 square miles In the United States the chief fisheries are off the coasts of Maine and Alaska The Maine catch is used largely in the canning of sardines Most of the Alaskan catch is manufactured into fish meal and oil The meal is fed to poultry swine and other animals The oil is used in the manufacture of many industrial products

THE MOST FAMOUS OF FOOD FISHES



This is the common herring of the North Atlantic Usually about a foot long some specimens may reach a length of 18 inches A single female deposits more than 30 000 eggs each season The herring feeds on sea plants and small animal life

HESSIAN FLY Tiny though it is—about one-eighth of an inch long—this insect pest does more damage to the grain field than any other Its *larvae* or young suck the sap out of the tender shoots of wheat rye and barley The damage to wheat alone has reached at least $100 000 000 in one year in the United States There have been many widespread invasions, and local outbreaks of the pest occur nearly every year The average annual damage amounts to many millions of dollars

The Hessian fly has long legs long feathery antennae, and oval hairy wings It belongs to the gall gnat family (*Cecidomyiidae*), including also the resin gnat the wheat midge, and the pear midge A female Hessian fly deposits from 100 to 150 eggs, hardly one fiftieth of an inch long in the grooves on the upper sides of young wheat leaves The pale red larvae or maggots hatch out in about five days, move down into the leaf sheath and there suck the juices from the plant stem Before they grow into adult flies they pass through the pupal stage in which they resemble and are called, flaxseeds No remedy for this pest is known Preventive measures include late sowing after the insects have died crop rotation and plowing under of all infested stubble

The Hessian fly gets its name from the common belief that it was brought into America by the Hessian troops during the War of the Revolution Scientific name *Phytophaga destructor*

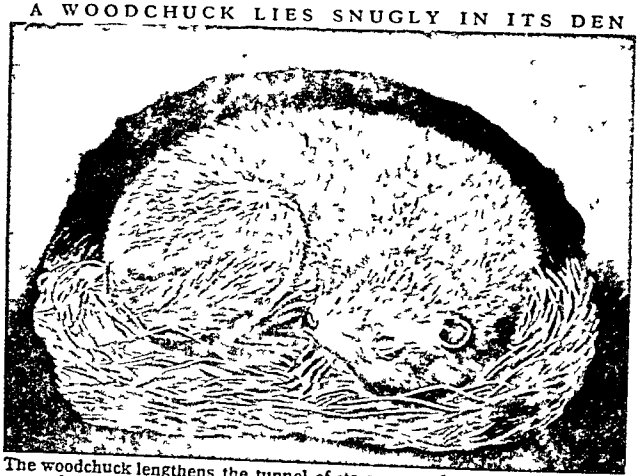
HIBERNATING *to* LIVE *through Winter* COLD

HIBERNATION. Before northern winters begin, many birds travel south to warmer climates Some four-footed animals go southward too, but hardy creatures such as rabbits and foxes stay where they are and live as actively as they do in summertime

Many animals, however, neither travel southward nor remain active. Instead, they hide in sheltered places and become so quiet that they often seem to be dead. Though we sometimes say they "go to sleep" for the winter, they really hibernate.

Different animals hibernate in different ways. Many insects do so as larvae or grubs which hide under dead leaves, lie in rotting wood, or burrow into the ground. Most caterpillars (young butterflies and moths) turn into hard-shelled chrysalids or pupae. Often they lie covered by silky cocoons which they spin. Mourning cloak butterflies, however, spend the winter as full-grown insects. They hide among logs, under leaves, or in cracks covered by loose bark. On warm winter days the butterflies often crawl out and flutter about in the sunshine. Ladybird beetles also come out on warm days, but they do not hide alone as butterflies do. Instead, they gather in swarms that number hundreds or even thousands.

A WOODCHUCK LIES SNUGLY IN ITS DEN



The woodchuck lengthens the tunnel of its summer home and hibernates in the chamber at the end of the tunnel, several feet under ground.

Most fresh-water fish remain active all winter, though carp and bass become sluggish and probably do not eat. In the sea, certain flounders and the wide-mouthed toadfish wriggle into the mud and hibernate under shallow inlets and bays

American toads push their way down into the ground. Tree frogs hide in hollow trees, but adult green frogs sprawl out under stones in ponds and streams. Their tadpoles lie in soft mud.

Snakes find shelter in holes and rocky dens. These may be near the surface or as much as 15 feet deep. If these holes or dens are large enough, dozens or even hundreds of snakes may gather and spend the winter in tangled balls

Box turtles burrow into soft ground, while painted turtles dig burrows in the banks of streams. Mud turtles and others bury themselves in mud on the bottoms of ponds. There they lie without breathing for as much as four months at a time.

Before migration was understood, people thought birds hibernated in caves or under water. After migration was discovered, no birds were thought to hibernate. But in 1946 birds related to whippoorwills were found, apparently hibernating, on a mountain in southern California. There are signs that other birds may become sluggish or even dormant in winter.

Woodchucks are the best-known hibernators among mammals They are the "ground hogs" which are said to come out of their burrows February 2, but go back for six more weeks of winter if they see their shadows Actually, woodchucks go into burrows four or five feet underground in September or October. There they stay without moving till the middle or end of March. Ground squirrels, jumping mice, and some bats also hibernate for four to seven months

Bears are not nearly such perfect hibernators. In the Southern states, such as Florida, bears are active all through the year In the North, black bears "den up" when winter comes, but when the cubs are born, their mothers care for them and nurse them. On warm winter days the male bears often wander about. Red squirrels, chipmunks, and skunks do the same, and badgers as far south as Iowa "den up" during only the coldest weather.

Hibernation Differs from Sleep

Such animals never become dormant, and they seem to spend much of their time dozing or in sleep. This is very different, of course, from dormant hibernation Sleeping animals relax, but their way of living does not change. True hibernators, however, almost stop living Many insects, spiders, and snails are frozen solid; some frogs and northern fish are partly frozen Woodchucks become cooler and cooler, till their bodies are only a little warmer than the air in their burrows. The animals also breathe very slowly, while the beating of their hearts both slows down and becomes irregular. The same changes take place in hibernating ground squirrels and mice.

In spite of these changes, hibernating mammals are protected against freezing. If the weather becomes dangerously cold they "awaken," move about, and raise the temperatures of their bodies. Any that fail to do this freeze to death.

Chipmunks take food into their burrows and eat it when they are active on warm winter days. Almost all animals unconsciously prepare for hibernation by eating large amounts of food during summer and storing it in thick layers of fat. Woodchucks, ground squirrels, and bears eat so much before hibernation

that their bodies become very plump Even turtles snakes and frogs accumulate fat which provides energy for life during the months when they do not eat

Animals inherit the tendency to hibernate just as they inherit their shape color and other characteristics But this tendency must be helped by other factors such as cold fatness or hunger and darkness

Cold is the most important factor encouraging hibernation Ground squirrels snakes insects and other animals become sluggish as soon as the weather grows chilly and as it turns colder they become dormant Skunks chipmunks and badgers also take to their burrows as autumn weather turns cold

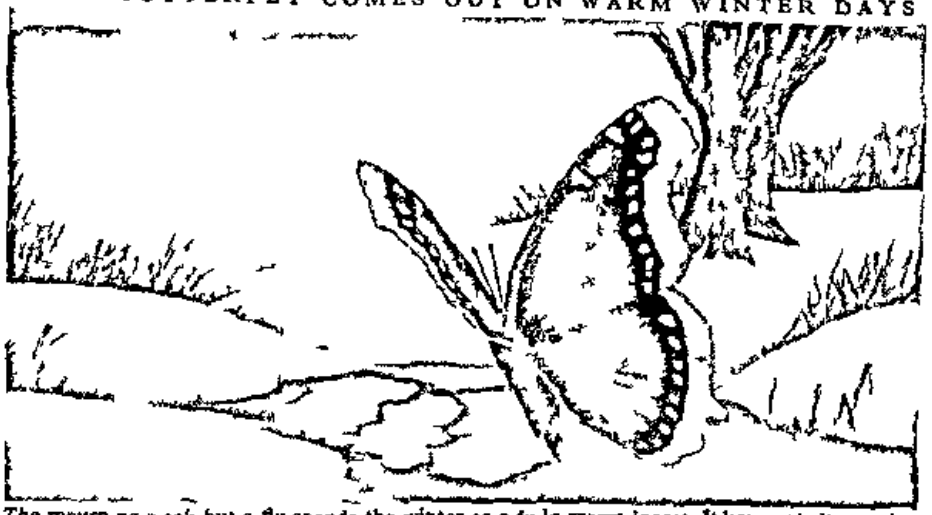
Hunger and fatness affect different animals Bats hibernate when food becomes scarce though woodchucks retire to their burrows while it is plentiful Mountain marmots also called siffleurs or whistlers hibernate during the first autumn snowstorm if they have thick coats of fat Otherwise they come out after the storm and keep on eating Ground squirrels that fatten on scraps and gifts of food from tourists hibernate two to four weeks earlier than others that are not so well fed The fattest animals remain dormant longest—a fact that also is true of bats

Darkness and quiet are very important Most animals hibernate in dark places and when the time comes for them to do so they try to get away from light Even insects that normally fly or crawl toward bright light seem to be attracted by dark cracks and corners when autumn comes

Animals that hibernate in burrows or dens always are sheltered from noise Therefore noise disturbs hibernating ground squirrels and woodchucks In zoos which are noisy as well as light many animals that normally hibernate remain active during the winter

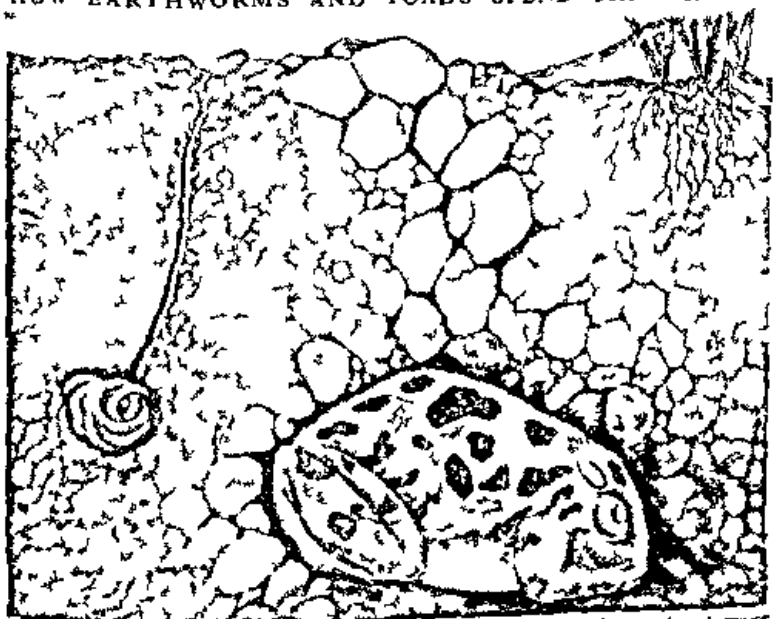
Aestivation (or *estivation*) differs from hibernation since it takes place during the summer In deserts winter and spring are the times of plentiful food water and comfortable temperatures Summers are dry and very hot and food often becomes very scarce Certain desert ground squirrels therefore take to their burrows in June or July and remain there several months The desert tortoise of the southwestern United States both hibernates and aestivates

THIS BUTTERFLY COMES OUT ON WARM WINTER DAYS



The mourning cloak butterfly spends the winter as a fully grown insect It lies in shelter under logs leaves or loose bark during cold weather but it comes out on warm sunny days

HOW EARTHWORMS AND TOADS SPEND THE WINTER



The American toad digs into the ground backward throwing the earth sideways with the hind feet and wedging the body downward with the front feet The loose earth falls back into the hole as soon as the toad has worked itself in Near the toad is an earthworm coiled at the bottom of its burrow

HICKORY The most typically American trees are the hickories particularly the shagbark From the hard tough wood of this tree the pioneers fashioned axhandles wagon shafts wagon wheels and many other useful things They burned it in stoves and smoked hams and bacon with it Every fall they harvested the hickory nuts

To this day the shagbark and certain other hickories serve these same purposes In addition lawn furniture skis ladder rungs gymnastic bars pump rods and picker sticks for cotton mills are also made of hickory wood

For many of these things *second-growth hickory* is preferred This is the wood of trees that have sprung up where old hickory groves were cut down With no large neighbors to compete with them for sunlight and water the new hickory trees springing

BIOGRAPHY OF A HICKORY NUT



This picture story of the shagbark hickory nut begins with a big firm bud (upper left). In the next six pictures we see how this bud and its neighbors lengthen and swell until at last they open out into long slender leaves. Then appear long spikes of tiny flowers (lower left). Next we see the climax of these events—the hickory nut growing on the tree and wearing a thick husk with four deep seams. The last picture shows us the ripened fruit and the way the husks fall off in autumn, exposing the hard nut inside. Similar to this in development is the much larger nut of the shellbark hickory.

either from seeds or from old stumps develop heav er and stronger wood than that of old growth hickor es

The Shagbark and Its Relatives

The shagbark (*Carya ovata*) grows in every state in the eastern half of the Union It prefers rich bottomlands but is found also on low h lls It grows very slowly At the age of 5 it is only about 17 inches tall at 30, only 20 to 30 feet tall and 3 to 4 inches in diameter When 200 to 300 years old it may be 80 to 100 feet tall and 2 to 3 feet in diameter Trees more than 350 years old and 4 feet across have been found Seasoned shag bark wood weighs as much as 55 poun ls a cubic foot White oak and black locust, the next heaviest woods of the United States weigh only about 50 pounds a cubic foot

THE SHAGBARK



The shagbark commonly g ows n company w th other h ckories and oaks But t has a d st nct ve featu e clea ly l lustrated he e The ba k s looser and shagg er than that of other h cko es

Three other hickories are also impor tant for their wood The shellbark hick ory (*Carya laciniosa*) closely resem bles the shagbark but has larger nuts and leaves It grows on moist bottom lands of the Ohio and M ssissippi River valleys The pignut hickory (*Carya glabra*), a somewhat smaller tree grows on uplands in most states east of the M ss ssippi River Under favorable con ditions, it *may grow* wood that is even l eavier and harder than that of the shagbark The nuts are thin-shelled but often so bitter they are left for pigs to eat Its bark is dark gray and narrowly ridged The mockernut hickory (*Carya tomentosa*), commonly found on hills and bottomlands of the South com pares with the shagbark in wood and in size but the ridges of its bark are rounded instead of shaggy The nut almost round has a very thick shell and a disappoint-ingly small kernel (hence the name mockernut)

Hickories belong to the genus *Carya* or *Hicoria* of the walnut family (*Juglandaceae*) All the thirty or more *species are natives* of the eastern Unite l States and Canada except three which are foun l in Mexico China an l Indo China respectively Those in the United States are class fied either as *tr e hickories* valued chiefly for their wood or as *pe an hickories* valued chiefly for their n its (*see* Pecan)

HIEROGLYPHICS The name comes from two Greek words meaning sacred and carving It w as u ed by Greek and Lat n writers to describe the sacred char acters of the ancient Egyptian language It is now ap-plied to other systems of writing such as the old Chi nese in which symbolic figures of objects are used to convey meanings instead of using alphabetic letters to spell out the sounds of words (*see* Writ ng)

HILL JAMES JEROME (1838–1916) The career of James J Hill *emp re* bu l ler an l financier was l ased on one great idea—that of creating a railr a l sy tem through the undeveloped Northwest Born near Guelph Ontario of Scott sh Irish parents he had early decided to become a doctor This plan had to be d scarded however when an accidentally d s-charged arrow cost him the sight of one eye

At 18 he arrived at the frontier village of St Paul Minn and took whatever work he could get He was at various times shipping clerk railroad station agent and trader He traveled the wil derness by oxcart or horseback and with dog sledges He grasped its agricultural po bilities and learned something of the m neral wealth of the Lake Super or region He kne v that a railroad through that territory could be a success

Hill s chance came in 1878 With three ther men he formed a syn licate which purchased the St Paul and Pacific Rail ad The roa l had never ma le any profits and though it had a valuable right of way lead ng to the Northwest little construction work ha l been done

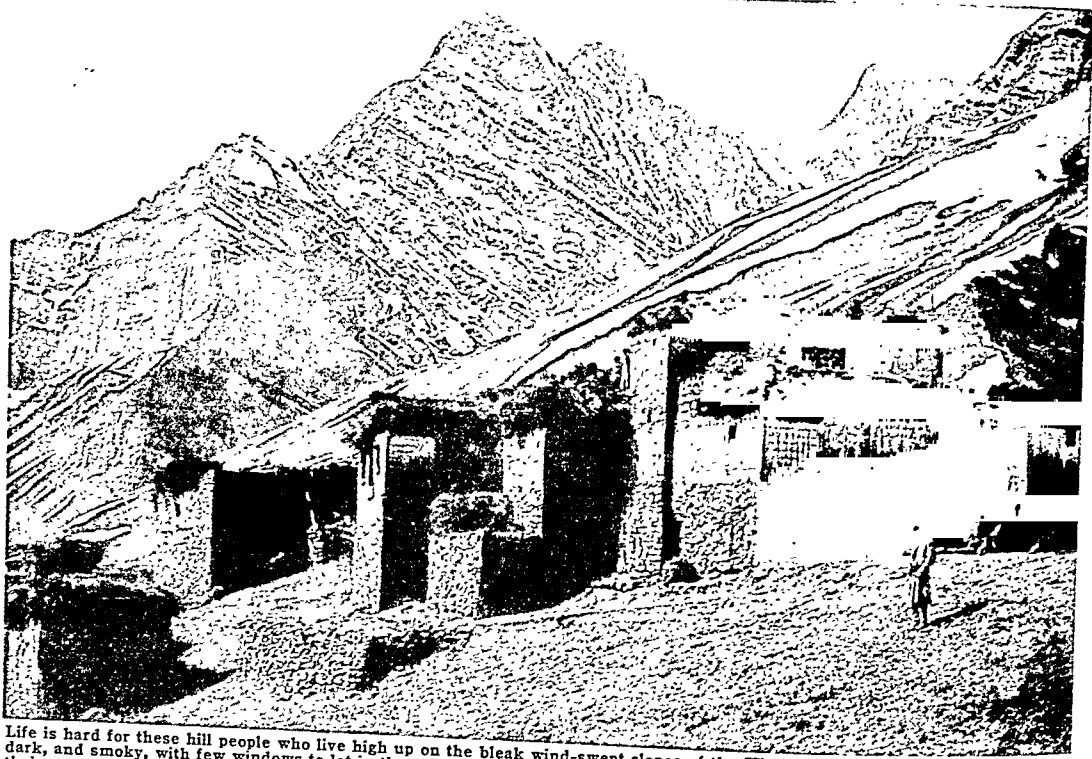
In just 1o years Hill l ad not only turne l failure into succe s but had absorbed many otl er rail lines into one c rporate system Between the years 1891 and 1906 a mile of railroa l was la d and equipped for every working day of that period And all th s was accom pl shed without government assistance although nearly every other western ra lroad at this time received publ c land grants In the meantime Hill deve lope l steamship lines on the Great L kes and the I acific coa t an l made them a part of what we now c ll the (reat Nort ern system

He d d not s t back to wa t for the Northwest to become prosperous he made it prosperous by encouraging home-seekers to settle in the new territory an l assisting them on the road to prosperity D stributing blooded bulls free to farmers was typical of his metho ls In later years H ll s soun l and practical judgment on national pr blems was eagerly sought

HIMALAYAS (*hĭ mā'lą yąz*) Tl e Himalayas do not form an extensive mount in system The length of 1 500 miles is but l ttle longer than the Appalachians an l tl e w dth is no greater tl in that of the Andes in Chile But in elevation tl is system ranks first From the south ern of its t o parallel ranges, between 40 and 50 peaks spring more than 23,000 feet in the a r overtopping all other mountain systems on the earth Mount Everest the highest of the Hima layas, towers 29 028 feet or about five an l a half miles above sea level The average elevat on of the passes is 18 000 feet

Lying on tl e northern front er of India, the Himalayas extend from the great bend of the Indus River to tl e Bral maputra of In lo-China, an l separate the plateau of Tibet from the plains of tl e Ganges They are located in the subtropic lat tude,

A VILLAGE ON THE SLOPES OF THE WORLD'S LOFTIEST MOUNTAINS



Life is hard for these hill people who live high up on the bleak wind-swept slopes of the Himalayas. Their stone houses are cold, dark, and smoky, with few windows to let in the cold or snow. They spend much of their time on the flat roofs, where they store their scanty crops and thresh grain. There the women spin and weave, and perform other household duties, when the weather permits.

so the snow line is lifted to 16,000 feet. The lofty southern ranges intercept the heat and moisture from the Indian Ocean. Their southern slopes are drenched with rain—more than 900 inches have fallen in a year at Cherrapunji—while the inner ranges and the Tibetan table-land are cold, dry, and half-desert.

On the southern slopes up to 5,000 feet the tea plant is cultivated. Grains and fruit are grown up to 12,000 feet, and in summer cattle are pastured up to 18,000 feet. Mountain villages are often imperiled by tigers and leopards; and snow blocks the passes from November to May. Innumerable streams and cascades from melting snow and glacier fields drop through wild gorges to swell the three great rivers of the Indian peninsula. Simla and Darjeeling are fashionable pleasure and health resorts.

Because of the majestic height and inaccessibility of many of the summits, the native peoples have from ancient times reverenced the Himalayas as the home of the gods. Pilgrims still climb to the source of the sacred Ganges for seasons of prayer and penitence. The name Himalaya means, in Sanskrit, "dwelling place of the snow." (*See also* Everest, Mount.)

HINDENBURG, PAUL VON (1847–1934). Soon after the first World War broke out, a message was rushed by German army headquarters to an obscure German general who had been living unnoticed in Hanover since his retirement at the age of 64 three years before. He was asked to take command against the Russians, then pouring like a flood over the eastern borders.

The old man replied by telegraph, "I am ready," and within two weeks set the world gasping by practically annihilating the invading forces in the battle of Tannenberg in the Masurian Lakes region (*see* World War, First).

Thus Paul von Beneckendorff und Hindenburg—the names are those of his family estates—in his old age started a second career that was to make him outstanding in his generation. In August 1916, after the battle of Verdun had failed to win the war for Germany, Hindenburg was given the chief command. Next year he beat off a tremendous Allied drive to "break through" the Western front, by a stubborn defense in new positions generally called "the Hindenburg Line." In 1918 Germany was forced to ask an armistice, and it became Hindenburg's bitter duty to lead his defeated army home. He retired a second time.

But in 1925 the Conservatives of Germany asked the old field marshal, then 78 years old, to be their candidate for president. His sweeping victory caused great apprehension among the former Allies. They knew his devotion to the Hohenzollerns and feared an attempt to restore the monarchy.

Again Hindenburg surprised the world. His oath

of office, he declared, required him to defend and maintain the republic—and so he did, in spite of personal feelings He also agreed willingly to all policies designed to reconcile Germany and her former foes, such as the Locarno Pact and entering the League of Nations, until 1933 Then the evident determination of the German people, in despair over their economic condition, to have a dictator, persuaded Hindenburg to give supreme power to Adolf Hitler Thereafter Hindenburg became virtually inactive until his death in August 1934

HINDUISM The vast majority of the people of India are Hindus The name "Hinduism' is given to the complicated combination of religious beliefs and social customs which govern them This system grew up through the slow transformation of very ancient beliefs When the Aryan conquerors first appeared in northern India, about 1500 B C there gradually arose a series of sacred writings in Sanskrit called *Vedas* These expressed a mystical pantheism—a belief that God was in everything, alive or not alive

The Vedas show us this early Aryan society divided into four social castes—the Brahmans or priestly caste, the Kshatriyas or soldier caste, the Vaisyas or farmer class, and the Sudras or laborers Early in their history, the Brahmans gained political as well as religious supremacy over the Kshatriyas and established the religion called Brahmanism, set forth in writings called "Brahmanas," which are commentaries on the old Vedas. Gradually, pantheism gave way to a religion of personal gods, of which Brahma, the "Father of all," Vishnu, the' Preserver and Siva, the "Destroyer " were the most important

As the native tribes of India were conquered one by one by the Aryans, the Brahmans found it wise to allow the new converts to retain many of their old beliefs and primitive religious customs Opposition to this adulteration of the old religion was in part responsible for the foundation in the 6th century B C of Buddhism and Jainism (*see* Buddha, India), but the Brahmans prevailed

Today, Brahmanism has ceased to exist as a separate faith, being swamped beneath the mass of popular beliefs and rituals, and later introductions such as Mohammedanism and Christianity Scores of sects have grown up, some emphasizing the worship of Vishnu, others of Siva, others setting up newer gods and goddesses Most of the sects base their practises upon popular sacred treatises of comparatively recent origin, called "puranas" At the same time the old fourfold caste system has split into thousands of branches and sub-castes each with its peculiar rites and restrictions

Most true followers of Hinduism observe broadly similar rules regarding food, marriage, and burial They do not eat meat because they think it wrong to take life human or animal One of the most interesting of the Hindu beliefs is the transmigration of souls, or "metempsychosis " According to this doctrine the soul of a person passes at death into some other creature, either human or animal If the person has led a good life, the soul goes upward in the scale—a low-caste, for instance, is reborn as a high-caste, but if the person has led an evil life, the soul may pass into the body of a dog or a pig or any other animal Everything in this life, say the Hindus, is a consequence of actions performed in a previous existence, and only by the gradual building up of a fine record or "karma ' can final salvation be achieved This doctrine is a very old one and was taken over in large part by the Buddhists when they split off from Brahmanism

The Hindu gods are supposed to have undergone a series of incarnations or "avatars" similar to those through which men must pass Thus the god Krishna is looked upon merely as a form of the god Vishnu

HIPPOPOTAMUS The features that make a hippopotamus at first sight seem grotesque are in reality extremely useful to the animal in its peculiar method of life The nostrils, the protruding eyes, and the ears are set on the upper surface of the flat face so that they alone project above water when the hippo ' swims, leaving the great head concealed The enormous scoop-shovel ' mouth is suited to gathering in plants from the bottom of lakes and streams The smooth barrel-shaped body is well fitted for under water travel

The name hippopotamus means river horse,' but this African animal is really related to the pigs The hippopotamus shares honors with the rhinoceros as the largest land mammal next to the elephant Adults commonly measure 12 to 14 feet in length and 5 feet or more in height at the shoulder Large specimens may weigh as much as 4 tons The body is covered with a hide 1½ inches thick on its back and sides, and hairless except at the tip of the tail Its huge red mouth is furnished with large teeth—tusks in the lower jaw It can close its large nostrils and short ears when under water

During the day the hippopotamus remains in the water, often in herds of 20 to 40 At times it disappears beneath the water for 8 or 10 minutes at a time, spouting and snorting when it comes to the surface When excited or in pain the body is covered with drops of a reddish fluid, which gives rise to the saying that the hippopotamus "sweats blood ', but the blood forms no part of this reddish sweat At night the hippopotamuses (or hippopotami) go to pasture, feeding on water plants and grasses They often journey 8 or 9 miles in search of good pasture and sometimes make inroads on cultivated fields For this reason they have been exterminated in most settled districts The natives also hunt the hippopotamus for its flesh as well as for its teeth, which are superior to ivory in hardness The explorer Sir Samuel Baker says of a wounded hippopotamus which he saw leave the water and gallop savagely inland "I never could have imagined that so unwieldy an animal could have exhibited such speed No man could have had a chance of escape "

HE'S A LITTLE TIRED—THAT'S ALL



You really couldn't ask a hippopotamus to cover up his mouth when he yawns. It would take a bale of hay to conceal that cavity. In spite of his fearful looking pair of jaws, the "water horse" is timid and inoffensive unless he is infuriated. With those long tusks he can root up grass like a steam plow.

Though formerly plentiful in Egypt the common hippopotamus (*Hippopotamus amphibius*) is now found only in equatorial Africa Several governments of the region protect the great beasts to prevent their extinction Remains have been found that indicate they once roamed over Europe and India The "behemoths" mentioned in the Bible may have been hippopotami The huge animals thrive and breed in captivity The young weigh about 50 pounds at birth and may be born under water They can swim before they learn to walk

In addition to the common hippopotamus, there is a pigmy species (*Hippopotamus liberiensis*), about 2½ feet high and 6 feet long When full grown it weighs only about 400 pounds This species is found chiefly in Liberia and neighboring regions

HISTORY'S PAGEANT *through the* AGES

HISTORY To read history is like visiting strange far-off lands Like travel, it takes us out of the narrowness and commonplace of everyday life and shows us the wonderful panorama of man in his slow ascent from earliest savagery to modern civilization The stupendous story goes back to the times of the old patriarchs with their flocks and herds the keen eyed Greek, the stately Roman, the watching Jew the uncouth Goth, the horrid Hun the settled picture of the unchanging East, the restless shifting of the rapid West the rise of the cold and classical civilization, its fall, the rough impetuous Middle Ages, the vague warm picture of ourselves and home

In prehistoric times, primitive peoples learned of their past through legends and myths Soothsayers and priests passed these tales on by word of mouth Fathers told them to their sons Fanciful and full of supernatural explanations, these stories changed with each telling Their picture of past events is romantic rather than accurate Our modern knowledge of prehistoric peoples has been gained chiefly from the remains of their homes and possessions uncovered by archeologists (*see* Archeology)

Recorded history could not exist until men had invented methods of writing and had developed an accurate calendar to measure the passage of time (*see* Calendar, Writing) Even then, the early records of ancient civilizations told little about the lives of the people They were mainly inscriptions on temples and palaces, designed to glorify the exploits of great rulers

Modern history uses all this material, and calls upon astronomy, geology, chemistry, and other sciences to help interpret the evidence Using all the findings it tells us how men struggled out of savagery, how nations and laws came into being and why we find human life organized as it is today.

The Birth of History

History, as we think of it now, originated with the ancient Greeks After they had beaten off *Persian* attempts at conquest, they were immensely interested in the Persians, the Egyptians, the Babylonians, and even the barbarians of distant lands In the 5th century B C, Herodotus spent perhaps 17 years traveling and gathering information about these strangers The Athenians were so delighted with his 'History' that they voted him a reward of ten talents a sum sufficient to make him a wealthy man

Thucydides, the great historian of the Peloponnesian Wars, has been called the first scientific historian As an Athenian general, he grasped the significance of these wars He wrote a careful record of events to help people who might face similar problems later He was the first to recognize that a study of the past might serve as a guide to the future

He also realized the need to be careful and to consider each side of a question As an Athenian he was inclined at first to take the Athenian view of the wars between Athens and Sparta But the Athenians exiled him, and for many years he studied the war from the Spartan viewpoint His example taught all later historians that they should use similar care in trying to get at the truth

The Spirit of History

Thucydides is quoted as saying that "history is philosophy teaching by example." Certainly to be 'historically minded' is to see things in relation and in perspective, and to judge tolerantly. We must remember how differently men have thought and acted in different times We must always keep an open mind ready to receive and weigh new evidence. If we grasp this idea, we will never think that a historian is someone who can remember dates That childish idea is like calling a man a statesman because he can remember the names of voters in his districts A waiter could remember more names and a telephone operator more numbers than the greatest historian.

The true historian is not content to take all his facts from other historians Today he makes sure that his statements are based on sound "documents" or 'sources" which go back to the time of the facts themselves Those sources are of all kinds—ruined monuments, old tombs and other material remains, legal papers, letters, diaries, newspapers, and written or printed narratives of eyewitnesses, even myths and fables contemporary pictures, drawings, photographs, and the like Sometimes the discovery or the finding of the key to new sources—such as the hieroglyphs of ancient Egypt or the cuneiform tablets of Babylonia and Assyria—adds whole new realms to our historical knowledge

But the historian needs continually to be on his guard not to be misled by his sources A document may be entirely forged Its author may be deliberately lying He may be so prejudiced by national, religious party, or personal bias as to be grossly unfair to the other side If honest, he may be misinformed as to the facts and mistaken in his inferences. Scores of pitfalls must be avoided by the research worker in this fascinating field

Anyone who reads the accounts published in the different countries concerning the causes and results of wars, or who sees how widely the reports of political affairs in Republican newspapers differ from those in Democratic ones today, will realize that the historian needs caution and training in handling his sources.

"Criticism for good faith and accuracy" has become a special branch of learning. Every trained historian asks, "Did this writer mean to tell the truth?" And second, "Was he in a position or frame of mind to tell the truth even if he wanted to?" Every statement therefore must be patiently weighed and tested, and combined with all other available information to get at the truth. As a result of such training it has well been said that "by the mechanism now at his command the scientific explorer can read more history from the dust heaps of Abydos than Herodotus, the greatest traveler of antiquity, could gather from the Egyptian priests of Saïs."

"In a certain sense all men are historians. Is not every memory written quite full with Annals, wherein joy and mourning, conquest and loss manifoldly alternate; and, with or without philosophy, the whole fortunes of one little inward Kingdom and all its politics, foreign and domestic, stand ineffaceably recorded. . . . Thus, as we do nothing but enact History, we say little but recite it: nay rather, in that widest sense, our whole spiritual life is built thereon. For, strictly considered, what is all Knowledge too but recorded Experience, and a product of History; of which, therefore, Reasoning and Belief, no less than Action and Passion are essential materials?"—Thomas Carlyle.

Formerly history was regarded chiefly as a branch of literature, and a pleasing style was considered of first importance. Today the emphasis is placed, as in science and other branches of study, mainly upon accuracy of facts, and the soundness and breadth of the understanding which the historian presents of man's life in the period with which he deals.

History is really a ceaselessly flowing stream, ever widening and deepening its course; but for convenience we divide it into more or less artificial periods. This does no harm if we remember that changes in history, like changes of the seasons, are gradual, and each period passes into the next as imperceptibly as winter into spring, or as life undergoes the slow but constant changes from childhood to youth, manhood, and old age.

To the long period before written records begin when man was taking his first steps in the arts which make up civilization, we give the name Prehistoric Age (*see* Stone Age). Ancient History covers more than half the span of our recorded knowledge. It stretches from the beginnings of Assyrian and Egyptian inscriptions, through "the glory that was Greece, the grandeur that was Rome," to the coming into the Roman Empire of the Germanic barbarians who overthrew classical civilization (about 3000 B.C. to about 375 A.D.).

The Middle Ages extend from 375 A.D. to about 1500. This period starts with an epoch of confusion and transition which lasts to about 800 A.D.; to it (if anywhere) the term "Dark Age" may be applied. Then comes the height of the Middle Ages, from Charlemagne to Dante (800 to 1300), when feudalism, monasticism, scholasticism, the Crusades, and Gothic architecture flourished, and a world empire and a world papacy confronted each other and strove for mastery. The period closes with a second epoch of transition (1300 to 1500), which we call the Renaissance (*see* Renaissance). Since 1500 we have the Modern Period, characterized by the organization into national states, the spread of discovery and European settlement, the progress of science and inventions, and the rise of democracy.

Written records go back only about 5,000 years. But geologists believe that the earth is at least 1,800,000,000 years old, and men have lived on it for scores or perhaps hundreds of thousands of years. To give some idea of the short duration of recorded history compared with this vast expanse of time, Prof. J. H. Robinson asks us to imagine a library of many volumes of a thousand pages each, one page for every 5,000 years that the earth has existed. The whole of recorded history from the earliest Assyrian and Egyptian inscriptions to the present day would scarcely cover the last page of that stupendous journal!

If history as a study is often dull and dry, a mere catalog of names and dates of rulers and battles and treaties, it is the fault of the books and not of history itself. Nothing can be more fascinating than the true story of how men and women have lived their lives in the past and in far distant lands—their houses, food and clothing, how they cultivated their fields and manufactured goods and traded with their neighbors, the games their children played and the parents' beliefs about God and the world of Nature, their laws and manner of government, the songs their poets sang and the beautiful things their artists made. All of this is included in the history which scholars today study and teach.

Even wars and political struggles are interesting when we once know what they were about and how they were carried on, and become well enough acquainted with the heroes and leaders to feel that they were real men and women dealing with things that were of vast importance to their peoples. The great English historian Freeman once wrote that "History is past Politics and Politics present History." But this view is too narrow. Today the historian includes in his survey the whole life of man in the past, as revealed by documents, archeological relics, and all other "sources" which may shed light on the subject (*see* World History).

History Shown in Charts

HISTORICAL charts are to history what maps are to geography They help us to visualize the facts—to fix them in *time* as maps do in *space*—and so aid both the understanding and memory When the history of the chief countries is shown in parallel columns as here there is the added advantage of synchronizing the events

A glance across these pages will enable one to see what was happening in the different countries in any period Thus a student will quickly find that when the Greeks were besieging Troy, Samuel was ruling in Israel and Tiglath Pileser I and his armies were conquering to the Mediterranean He will learn that some of the Norman knights who invaded England with William the Conqueror lived to take part in the First Crusade, and that shortly before that the Northmen had discovered America In the same century that the Puritans were settling Plymouth and Boston there was revolution and civil war in England Huguenots were persecuted in France, a religious war was fought in Germany and the Dutch won their independence from Spain This graphic arrangement of contemporaneous events is valuable in teaching the student to regard history not as a collection of disconnected incidents but as a series of related movements, each contributing to the story of civilization

PREHISTORIC PERIOD

Old Stone Age Began About 500 000 Years Ago Neolithic New Stone Age Began About 6000 B C

HISTORIC PERIOD — I. ANCIENT HISTORY

B. C.	EGYPT	PALESTINE	BABYLONIA AND ASSYRIA	AEGEAN REGION AND GREECE	ITALY
4000	Predynastic period in Nile Valley			New Stone Age in Crete	New Stone Age in Italy
	3100 Beginning of historical period with unification of country under the first dynasty of kings		3100–2340 (about) Sumerian city kingdoms (non Semitic) Development of cuneiform writing		
3000	2700–2200 OLD KINGDOM (Dynasties III IV) high cultural development capital at Memphis, in Lower Egypt Great Pyramids at Gizeh	Canaanites are settled in Palestine and have many flourishing cities	2340–2180 (about) Semites under dynasty of Sargon of Akkad rule Sumeria.	3000–2900 Transition from Stone to Bronze Age Dawn of European civilization in Crete. 2900–1700 Minoan Age in Crete high civilization with capital at Cnossus 2500–2000 Second city of Troy flourished	
	2200–2050 First Intermediate Period (Dynasties VII–X) monarchy weakened rise of independent feudal lords.				
2000	2050–1800 MIDDLE KINGDOM (Dynasties XI XII) capital moved to Thebes in Upper Egypt strong monarchy and flourishing culture		1800 (about) Hammurabi founds first dynasty of Babylon Code of Laws issued Assyria, in the north under Shamshi Adad I becomes independent of Babylonia	2000–1500 3d 4th 5th and 6th cities of Troy	2000 Lake dwellers occupy Italian lakes
	1800–1570 Second Intermediate Period (Dynasties XIII XVII) Hyksos rule Egypt (Dynasties XV XVI)		1600–1200 (about) Kassite immigrants from Elam gradually gain power in Babylonia and establish Kassite dynasty	1500–1450 GOLDEN AGE OF CRETE 1500–1200 7th city of Troy (Homeric city)	
	1570–1090 NEW KINGDOM (Dynasties XVIII–XX) The period of empire		1400 Babylonia has well-established diplomatic and commercial relations with Egypt	1500–1100 Greatness of Mycenae Tiryns etc	
	1504–1450 Thutmose III conquers Palestine and Syria	1300 (about) Israelites conquer Palestine	1100 Tiglath Pileser I of Assyria conquers to the Mediterranean	1500–1000 Greek (Achaean) colonization of Greece and islands Dorian and Ionian conquests and colonization follow	
	1405–1370 Amenhotep III magnificent palace and temple at Thebes	1200–1000 (about) Rule of Judges. Samuel the last judge Wars against Philistines		1450–1200 Hittite Empire in Asia Minor	
	1370–1352 Amenhotep IV (Akhenaton) tries to reform old religion builds new capital at Tell el-Amarna. Nefertit his queen	Saul becomes first king of the Israelites. Dies in battle against Philistines		1200 Fall of Troy following siege by Greeks gradual growth of hero songs about the siege	
	1298–1232 Rameses II completes great hall of Temple at Karnak				
1000	1090–950 Dynasty XXI rules at Tanis, and priest kings at Thebes.	King David defeats Philistines and establishes capital at Jerusalem		1000–900 Greek colonization of Aegean islands and Asia Minor extended	1000 Etruscans come into Italy (probably from Asia Minor by sea)
	950 Beginning of Dynasty XXII of Libyan kings	King Solomon builds Temple After Solomon's death kingdom divided into Israel and Judah	930 (about) Brilliant period of Assyrian history begins. (Great activity in architecture literature and sculpture as well as in military conquests.)		1000 Latin villages established along Tiber
	925 (about) Sheshonk I first king of Libyan dynasty invades Palestine	925 (about) Egyptians invade Palestine			
900	Dynasty XXII continues through century	Dynasty of Omri at Samaria Prophets Elijah and Elisha.	885–859 Ashurnasirpal II restores the empire of Tiglath Pileser I marches to Mediterranean	900–800 Iliad and 'Odyssey' composed (by Homer?)	
		853 Ahab takes part in battle of Karkar		820 Lycurgus frames laws for Sparta	
800		Prophets Amos and Hosea		800–700 Rise of aristocracies in Greece	
			750–606 ASSYRIAN EMPIRE at its height.	776 Traditional date of first record of Olympic games (1st Olympiad)	753 (traditional date) Rome founded.
	730 Dynasties XXIII and XXIV weak and short-lived, end with conquest of Egypt by Ethiopians beginning of Dynasty XXV (Ethiopian)		745–727 Babylonia subjugated by Tiglath-Pileser III of Assyria. Assyrian rule extended to *Egypt.*	750–650 Sparta conquers Messenia becomes a military power	750 Etruscan kings invade Latin towns.

B.C.	EGYPT	PALESTINE AND SYRIA	BABYLONIA, ASSYRIA, AND PERSIA	GREECE	ITALY AND ROME
		722. Israel destroyed; people carried to Assyria.	722–705. Conquests of Sargon II. 722. Conquest of Israel; people made captive.	734 (traditional date). Syracuse founded in Sicily.	
		701. Sennacherib invades Judah. Prophet Isaiah.	705–681. Sennacherib; great palace at Nineveh; destruction of Babylon.	708. Tarentum founded in Southern Italy.	
700	671. Assyria conquers Egypt. 663. Assyrians plunder Thebes and withdraw; native Egyptian rulers restored; Dynasty XXVI (Saite); revival of power and art.		681–668. Esarhaddon; Babylon rebuilt. 668–626. Ashurbanipal.	650–600. Rise of tyrannies in Ionia; established in Corinth, Megara, etc. 630. Cyrene founded in Africa. 621. Code of Laws for Athens issued by Draco.	700. Greek colonies in Sicily and Southern Italy.
		621. Josiah reforms religion of Judah. Prophet Jeremiah.	606–539. CHALDEAN (NEW BABYLONIAN) EMPIRE. 604–561. Nebuchadnezzar; wars in Palestine and Syria. Hanging Gardens of Babylon built.	594–593. Solon, archon of Athens, reforms Athenian constitution.	
600		Prophets Haggai and Zechariah.	586. Capture of Jerusalem. Jews carried to Babylon. 546. Cyrus the Great defeats Croesus, king of Lydia; captures Sardis. 539. Babylon taken by Cyrus the Great; becomes Persian province.	560–527. Pisistratus tyrant of Athens.	
	525. Persia conquers Egypt and makes it a Persian province.		539–330. MEDO-PERSIAN EMPIRE. 525. Cambyses II conquers Egypt. 522–486. Darius I rules from Aegean and Egypt to India; advances to Danube against Scythians (513).	514. Hipparchus, son of Pisistratus, slain by Harmodius and Aristogiton; his brother Hippias expelled, 510. 509. Reforms of Clisthenes at Athens.	510 (traditional date). Kings (Etruscans?) expelled from Rome; republic founded.
500			499. Revolt of Greeks in Asia Minor; two expeditions against Greece (492, 490). 486–465. Xerxes. Great expedition against Greece (480). Internal decay of Persian Empire; frequent revolts of Egypt, etc.	500. Athens aids Greeks of Asia Minor against Persia. 493–492. Themistocles archon of Athens. 493–479. Persian Wars. Darius sends expedition into Thrace and Macedonia (493); attacks Greece (Marathon, 490); Xerxes invades Greece (Thermopylae and Salamis, 480, Plataea, 479). 478. An Athenian Empire founded by Confederacy of Delos, against Persians; Athens and Sparta at head of rival leagues. 444–429. AGE OF PERICLES, height of Athenian culture. (Aeschylus, Sophocles, Euripides, Aristophanes, Herodotus, Thucydides, Phidias, Ictinus, Socrates, Zeno.) Acropolis developed; Parthenon built.	494. Struggle between Patricians and Plebeians tribunes created.
		444. Nehemiah returns to Jerusalem and rebuilds city and temple. Prophet Malachi.			450. Roman laws made public (12 tables).
	404. Egyptians revolt and throw off Persian rule.		401. Unsuccessful revolt of Cyrus the Younger against his brother, Artaxerxes II; retreat of Xenophon and the 10,000 Greeks.	431–404. Peloponnesian Wars between Athenian and Spartan alliances; Athenian expedition to Syracuse unsuccessful (415–413); Spartans besiege Athens (413–404); Athenian fleet destroyed at Aegospotami (405); surrender of Athens.	
400		397. Ezra returns to Jerusalem.		399. Socrates put to death in Athens.	396. Romans take Vei. after 10 years' siege; end danger from Etruscans.
			362–338. Artaxerxes III king of Persia; in 346 suppresses with great cruelty revolt of Sidon chief city of Phoenicia.	379–362. War between Sparta and Thebes (Epaminondas); Leuctra (371); leadership passes to Thebans. 357–355. Revolt of Athens' allies destroys Athenian Empire. 359–336. Rise of Macedon to power under Philip (power of Thebes destroyed at Chaeronea, 338). Macedonian supremacy in Greece.	390. Gauls plunder Rome (Battle of the Allia). 367. Licinian laws passed to equalize Patricians and Plebeians.
	341. Egyptian independence ends with new Persian conquest of Egypt by Artaxerxes III.			336–323. Alexander the Great. Invades Asia and founds Greek (Hellenistic) power of far-reaching influence.	343–341. First war against Samnites (kindred mountain tribes southeast of Rome). 340–338. Revolt of Latins crushed; Latin League dissolved.

MACEDONIAN EMPIRE

334. Alexander attacks Persian Empire (Battle of the Granicus, 334; of Issus, 333; of Arbela, 331).
332. Palestine conquered by Alexander.
332. Alexander conquers Egypt from Persia and founds Alexandria.
330. Darius III slain while fleeing after Arbela; end of Persian Empire.
323–276. Wars among the successors of Alexander (Diadochi), who divide the Macedonian Empire.

EGYPT	PALESTINE	SYRIA AND ASSYRIA	GREECE
323–30 B.C. Ptolemies (descendants of one of Alexander's generals) rule Egypt; great library at Alexandria.	323–276. Ptolemies rule Palestine.	312–281. Seleucus, son of one of Alexander's generals, rules from Syria to the Indies (his descendants called Seleucids).	323–146. Macedonia and Greece under Demetrius Poliorcetes and his descendants. 323–322. Greek states fail in revolt against Macedonians.

326–304. Second Samnite War. Roman army defeated in the Caudine Forks and sent "under the yoke" (321). Victories of Romans at Vadimonian Lake (310) and Bovianum (305) end the war.

Rome becomes the dominant power of Italy south of the Rubicon River.

B. C.	EGYPT	PALESTINE	SYRIA AND ASSYRIA	GREECE	ROME
300	285–247 Ptolemy II (*Philadelphus*) brilliant court at Alexandria Egypt a navy rules eastern Mediterranean.	276 Antiochus of Syria conquers Palestine from Egypt.	250 Parthians under Arsaces revolt. 223–187 Antiochus the Great defeated by Romans at Magnesia (190) Seleucid rule curtailed in west	280–183 Aetolian and Achean Leagues prevent Macedonia securing complete power in Greece.	282–272 War with Tarentum aided by King Pyrrhus of Epirus 264–241 First War with Carthage (over Sicily) Rome becomes a naval power invades Africa and Sicily and defeats Carthage in numerous battles at sea Rome gains Sicily 218–202. Second War with Carthage Hannibal invades Italy over the Alps defeats Romans at Cannae (216 Scipio carries the war into Africa (204) and defeats Hannibal at Zama (202) Carthage becomes a vassal state 215–206 First Macedonian War
200	Decline of Egypt frequent wars of Ptolemies with the Seleucids of Syria	167 130 Maccabees (kings) rule Palestine as Roman vassals.	174–136. Mithridates I founds Parthian Empire (Media Persia Babylonia etc.	197 Macedonians defeated at Cynoscephalae by Romans and Greece freed from Macedonian rule 146 Achean League defeated by Romans and Corinth destroyed Greece passes under Roman rule	200–197 Second Macedonian War Greece freed 190 Antiochus of Syria overthrown (western Asia Minor under Roman control) 171 168 Third Macedonian War end of Macedonian monarchy 149–146 Third War with Carthage Carthage destroyed. 146 Macedonia becomes a Roman province. 133 Practically all Spain under Roman rule.
				133 133 Tiberius and Caius Gracchus attempt to reform the land laws and are slain 113–101 Cimbri and Teutones (Germanic invaders) defeated by Marius.	
100	Civil wars among degenerate Ptolemies pave way for fall 47 Cleopatra made ruler of Egypt under Roman supremacy 31 Cleopatra and Antony defeated at Actium Egypt becomes a Roman province.	63 Pompey makes Jews tributary to Rome. 40 Herod (the Great) recognized by Rome as dependent king of Judaea.	88–64. Mithridates VI (the Great) defeated by Romans Syria and Armenia submit to Rome	90 Roman citizenship granted to all Latins and most other Italians, following revolt of Rome's allies (Social War 90–88) 88–82. Civil War between Sulla (wealthy classes) and Marius (poorer classes) Reactionary reign of terror under Sulla as dictator 73–71 Revolt of gladiators and slaves under Spartacus. 66–62 Catiline's conspiracy (Cicero's speeches) 60 Caesar Pompey and Crassus form first Triumvirate 58–51 Caesar conquers Gaul two expeditions to Britain (55–54 B C.) 49–48 Civil war between Caesar and Pompey (Battle of Pharsalus Pompey slain) Under forms of the republic Caesar gets all power into his own hands 44 Assassination of Caesar by Brutus Cassius and others 43–42 Mark Antony Octavian (Augustus) and Lepidus form second Triumvirate and defeat Cassius and Brutus at Philippi 31–30 War between Octavian and Antony Antony and Cleopatra of Egypt defeated at Actium. 31 B C.–14 A.D Octavian rules as Emperor Augustus. Beginning of ROMAN EMPIRE. (Golden Age of Roman culture Livy Horace Vergil Seneca, Pliny the Elder)
TIME B C		4 *Birth of Christ.*			
TIME A.D	Under Roman rule Egypt enjoys a period of industrial and commercial prosperity	6 Judaea becomes part of Roman province of Syria. 70 Jerusalem destroyed by Titus following revolt Dispersal of survivors			14–37 Tiberius emperor (stepson of Augustus) 37–41 Caligula (great-grandson of Augustus) 41–54 Claudius Britain added to Roman Empire 54–68 Nero his crimes and excesses great fire in Rome Christians persecuted 69–79 Vespasian proclaimed emperor by his troops in Syria good rule 79–81 Titus (son of Vespasian) 79 Eruption of Vesuvius destroys Pompeii and Herculaneum 98–117 *Trajan, a Spaniard by birth and a great general* (conquest of Dacia defeat of Parthians in Syria Empire reaches greatest extent)
100	Revolt of native troops begins decline of Egypt.	132–135 Revolt of Jews suppressed by Hadrian survivors dispersed	114–116 Armenia, Mesopotamia and Assyria made Roman provinces. 193–211 Northern Assyria conquered by Rome		117 138 Hadrian adopted by Trajan frontiers strengthened Asia east of Euphrates given up magnificent buildings. 138–161. Antoninus Pius. 161–180. Marcus Aurelius, adopted son of Antoninus and a renowned Stoic philosopher Wars with barbarians along Danube 193–284 Emperors elected by the army 193–211 Septimius Severus war in Mesopotamia northern Assyria conquered
200	270 Egypt occupied by Zenobia of Palmyra 273 Egypt reconquered by Rome.		226–641 New Persian Empire under Sassanids 267–272 *Zenobia* queen of Palmyra defeated by Aurelian.		212 All freemen in the Empire made citizens (to get more taxes) 270–275 Aurelian recovers Palmyra and subdues revolt in Gaul new walls about Rome 284–305 Diocletian (resides in East) empire divided into four administrative prefectures great persecution of Christians abdicates
300	Quarrels between branches of the Christian Church lead to persecution of the Arians.				311 Christianity made legal. 323–337 Constantine the Great sole ruler capital removed to Constantinople empire reorganized. 325 Council of Christian church at Nicaea. 375 Beginning of TEUTONIC MIGRATIONS into the Empire 378 Visigoths defeat Roman army at *Adrianople.* 379–395 Theodosius the Great last ruler of united empire 395 Empire divided into Eastern and Western parts.
					395–476 WESTERN EMPIRE. 410 Alaric the Visigoth captures Rome. 455 Vandals from Africa sack Rome 476. German leader Odoacer deposes last Roman emperor in West
400					395 1453. EASTERN OR BYZANTINE EMPIRE. For nearly 1 000 years a defense against Asiatic invasions

	WESTERN EUROPE	ENGLAND	EASTERN EUROPE AND OTHER COUNTRIES
		Romans rule Britain since about 43–81 A.D.; Christianity introduced; Hadrian's wall begun (121).	375. Visigoths cross Danube; defeat Romans at Adrianople (378). 395. Death of Theodosius the Great, last ruler of united Roman Empire. 395–1453. EAST ROMAN EMPIRE (Arcadius emperor, 395–408).
	383–394. Wars for power among claimants of Empire in West ended by recognition of Theodosius (*see* Eastern Europe). 395–423. Honorius receives Western Roman Empire on permanent division (Stilicho, his minister).		
400	410. Sack of Rome by Visigoths under Alaric; Visigoths move into Spain (414). 429. Vandals cross from Spain into Africa; under Genseric plunder Rome. 451. Attila the Hun defeated at Châlons (in Gaul). 476. Odoacer, German mercenary, displaces Roman emperor; end of Western Roman Empire. 481–511. Clovis founds kingdom of Franks in Gaul (Merovingians); becomes Christian (496). 493–555. Ostrogoths (Theodoric the Great) rule Italy.	410. Roman legions withdrawn. 449–700. Angles, Saxons, and Jutes conquer Britain ("Angleland" or England).	474–491. Zeno eastern emperor.
500	511–751. Decline of Merovingian kings of Franks and rise of Mayors of Palace. 568–774. Lombard kingdom in Italy. 590–604. Pope Gregory I (the Great); Rome the head of Christendom.	577. Battle of Deorham; West Saxons reach Bristol Channel. 597. Augustine reintroduces Christianity.	527–565. Justinian emperor; Roman law codified; Vandals in Africa and Ostrogoths in Italy overthrown.
600	613. Queen Brunhilde of Austrasia (Eastern Frank-land) captured, tortured, and dragged to death by wild horses in Merovingian quarrels. 687. Pepin of Heristal becomes Mayor of Palace for whole Frankish kingdom (Battle of Testry).	607. Chester sacked and left desolate for 300 years.	622. Mohammed's flight from Mecca (the "Hegira"); founding of Mohammedan religion.
700	711. Mohammedans from Africa overthrow Visigothic kingdom in Spain. 732. Franks (Charles Martel) defeat Mohammedans at Tours (in France). 751. Pepin the Short (Mayor of the Palace) deposes last Merovingian king and takes the crown (Carolingian rule).	755–794. Offa king of Mercia.	750. Mohammedans rule all western Asia, northern Africa, and Spain—from Indus River to the Pyrenees.
800	800. Charlemagne, king of the Franks and ruler of most of western Europe (768–814), crowned emperor at Rome. 843. Partition of Verdun. Charlemagne's empire divided; separation of France and Germany.	827. Egbert of Wessex unites England. 871–899. Alfred rules southern England; Danes checked.	809. End of brilliant reign of Harun-al-Raschid, caliph of Bagdad. 862. Russian kingdom founded by Rurik the Northman (Kief, capital).
900	**FRANCE** 911. Normandy ceded to Rolf (Rollo), the Northman; decline of Carolingians in France. 987. Hugh Capet chosen king (Capetian line); Feudalism at height of its power.	**GERMANY AND ITALY** 911–918. Conrad I (Franconian) first non-Carolingian king. 936–973. Otto I, the Great (Saxon), ends anarchy in Italy; defeats Hungarians (955); revives Empire (962).	910–954. Northern England ("Danelaw") reconquered from Danes. 980. Danish invasions renewed.	905–959. Constantine VII ("Born in the Purple") emperor, patron of literature.
1000	1096. Council of Clermont; Pope Urban II calls First Crusade.	1002–24. Henry II (the Saint), last of the Saxon line. 1075. Investiture conflict begun by Pope Gregory VII (Hildebrand) and Emperor Henry IV (1056–1106).	1016–1035. Canute of Denmark king. 1042–66. Edward the Confessor king. 1066. Norman conquest (William I).	1000. Northmen discover America (Greenland discovered, 984).
	PERIOD OF THE CRUSADES—TO RESCUE PALESTINE FROM MOHAMMEDAN RULE—1096-1291		
	1096–99. First Crusade. People's crusade under Peter the Hermit fails. Crusade of nobles under Godfrey of Bouillon and others takes Jerusalem (1099) and establishes a feudal kingdom of Jerusalem.		
1100	1108–37. Louis VI (the Fat) establishes order in crown possessions. 1122. Concordat of Worms ends investiture conflict.	1100–35. Henry I ("the Lion of Justice"); a charter issued.	1144. Edessa taken by Mohammedans.
	1147–49. Second Crusade. Preached by St. Bernard of Clairvaux; led by Conrad III of Germany and Louis VII of France without results.		
	1180–1223. Philip Augustus; recovers Normandy, etc., from England. 1152–1190. Frederick Barbarossa (Hohenstaufen); quarrel with pope; defeated by league of Lombard towns.	1154–89. Henry II (Plantagenet) holds Normandy, Anjou, Maine, etc., in France. Conquest of Ireland begun.	1187. Capture of Jerusalem by Saladin.
	1189–92. Third Crusade. Led by Richard Coeur de Lion of England and Philip Augustus of France; Emperor Frederick Barbarossa drowned on way. Armistice with Saladin permits pilgrimages to Holy Places.		
1200	1209–29. Albigensian crusade. 1214. Battle of Bouvines; defeat of English and enemies of Frederick II. 1226–70. Louis IX (St. Louis); good rule. Crusade to Egypt (1248–54); to Tunis (1270). 1285–1314. Philip IV (the Fair). Power of king increased; quarrels with pope. 1200–1450. Hanseatic League between German cities promotes commerce. 1215–50. Frederick II; rules Naples and Sicily as well as Empire; quarrels with pope; Fifth Crusade (1228–29). 1254–73. Interregnum in Empire. 1273–91. Rudolph of Hapsburg king of Germany. 1295. Marco Polo returns from 20 years' travels in China and the East.	1204–06. King John loses Normandy and Anjou; forced to grant Magna Carta (1215). 1272–1307. Edward I; conquest of Wales (1282); wars with Scotland begun. 1295. Model Parliament called.	1202–04. Fourth Crusade directed against Constantinople by Venetians. 1206–27. Genghis Khan conquers China, Persia, Turkestan, and Southern Russia. 1291–1499. Growth of Swiss Confederation (Battle of Morgarten, 1315; Sempach, 1386). 1297. Fall of Acre; end of Crusades.
1300	1302. First meeting of Estates-General. 1302. Battle of Courtrai; Flemish townsmen defeat French knights. 1305–77. "Babylonian captivity of Popes" (papal residence at Avignon, France). 1328. Philip VI (Valois) becomes king. 1337–1453. Hundred Years' War with England (Peace of Bretigny, 1360; war renewed, 1369). 1364–80. Charles V (the Wise). Most of English possessions in France won back by Du Guesclin. **PERIOD OF ITALIAN RENAISSANCE** 1300–1500. Dante, Petrarch, Boccaccio, Giotto, Michelangelo, Da Vinci, Raphael, Titian. 1347–1437. Emperors of Luxemburg-Bohemian line. 1348. Black Death appears in Florence and spreads over Europe. 1356. Charles IV issues Golden Bull. 1377. Papacy returns from Avignon to Rome. 1378–1417. Great Schism (two, later three, claim to be pope). 1380. Venice crushes Genoa at Chioggia.	1314. Edward II defeated at Bannockburn by Scots under Bruce. 1327–77. Edward III. 1337–1453. Hundred Years' War with France. English victories at Crécy (1346) and Poitiers (1356). 1381. Peasants' revolt led by John Ball and Wat Tyler. 1399. Henry IV (Lancaster) overthrows Richard II.	1331–55. Stephen Dushan rules an extended Serbian Empire. 1354. Ottoman Turks gain foothold in Europe (Gallipoli). 1389. Serbs defeated by Turks in great battle at Kossovo.

	FRANCE	GERMANY	ITALY AND PAPACY	GREAT BRITAIN	OTHER COUNTRIES
1400	1415 Hundred Years War renewed in reign of Charles VI (insane after 1392) 1429–31 Joan of Arc saves France. (War ends in 1453 England loses all its possessions in France except Calais) 1461–83 Louis XI strengthens France 1477 Charles the Bold of Burgundy overthrown his duchy annexed to France 1494 Charles VIII invades Italy (Italian wars begun)	1410–37 Sigismund emperor 1419–36 Hussite Wars. (Ziska blind leader against Germans) 1440–93 Frederick III (Hapsburg) emperor 1450 Gutenberg invents printing. 1493–1519 Maximilian I emperor	1414–18. Council of Constance schism ended John Huss burned as heretic (1415) 1469–92 Lorenzo de Medici rules Florence 1494–98 Savonarola attempts reform in Florence	1415 Henry V invades France (Agincourt 1415) 1450 Jack Cade's rebellion. 1455–85 Wars of the Roses (Houses of York and Lancaster claim crown) 1485 Henry VII (Tudor) defeats Richard III (York) at Bosworth and ends war Strong monarchy established.	1453. Turks take Constantinople end of Eastern Empire 1492. Columbus discovers America 1492 Conquest of Granada Moors expelled from Spain 1497–98 Vasco da Gama reaches India by sea
1500	1515–47 Francis I, wars with Charles V over Milan Renaissance encouraged in France. *1562. Huguenot Wars begun* (St. Bartholomew's Massacre 1572) 1589–1610. Henry IV (Bourbon) Edict of Nantes ends Huguenot wars (1598)	1517 Luther begins Protestant Reformation Diet of Worms condemns Luther (1521) *1519–58. Charles V rules Spain, Germany Netherlands parts of Italy and America.* Opposes Luther wars against Turks (15 6–32) abdicates (1555–56) 1555 Religious peace of Augsburg (toleration of Lutherans) 1556–64. Ferdinand I. 1563. Council of Trent ends (beginning of Catholic recovery)	1503–13 Pope Julius II (Italian wars patron of Michelangelo and Raphael) 1508 League of Cambra (Pope Austria, France and Spain) against Venice. 1513–21 Pope Leo X (Medici) patron of arts and letters. *1542 Pope Paul III* establishes the Inquisition in Rome. 1571 League of Papacy Spain and Venice against Turks Battle of Lepanto, 1572)	1509–47 Henry VIII separation of English Church from Rome. *1547–53 Edward VI.* 1553–58 Queen Mary restores Catholic Church 1558–1603. Elizabeth establishes Church of England *Growth of sea power* industrial development. Elizabethan period of literature (Shakespeare) 1588 Spanish Armada destroyed	1518 Zwingli begins Reformation in Switzerland 1519–1522 Magellan circumnavigates the globe 1536 *Calvin* begins Reformation at Geneva 1540 Jesuit order founded by Loyola. 1556–98. Philip II succeeds his father Charles V in Spain, Italy Netherlands, and the *New World* 1568 Revolt of Netherlands against Spain siege of Leyden (1574) Union of Utrecht (1579) declaration of independence by the Dutch (1581)
1600	1610–43 Louis XIII political power of the Huguenots crushed (*Richelieu* chief minister of the crown) *1643–1715. Louis XIV* numerous wars of conquest extravagant court at Versailles brilliant period of French literature. 1685 Edict of Nantes revoked and toleration of Huguenots ended.	1618–48. Thirty Years War *Imperialist (Catholic)* generals Tilly and Wallenstein Gustavus Adolphus, Protestant king of Sweden victorious at Leipzig (1631) Lützen (1632) Peace of Westphalia (1648) 1640–88 Growth of Prussia under the Great Elector 1683 Vienna besieged for last time by Turks rescued by King John Sobieski of Poland	*1629 War over Mantua* between Spain (which possessed Milan) and Austria. 1684 Venice joins Austria and Poland in attack on Turks makes conquests in Morea.	1603–25. James I (Stuart) personal union of England and Scotland 1607 Virginia colony founded (Jamestown 1620 Plymouth colony settled (Boston, 1630) by Puritans fleeing persecution in England 1642–49 Civil war between Crown and Parliament Marston Moor (1644 Naseby (1645) Charles I executed (1649) England a commonwealth. 1653–58. Cromwell rules England Scotland and Ireland as Lord Protector 1660 Stuart restoration under Charles II *1688. "Glorious Revolution"* expels James II and seats William and Mary Protestant succession established.	1611–32 Gustavus Adolphus king of Sweden 1644 Manchu rule begins in China 1648 Spain recognizes independence of the Dutch Netherlands 1672–1715. Peter the Great introduction of western culture in Russia *St. Petersburg founded* (1703) 1697–1718. Charles XII of Sweden.
1700	1701–13. War of the Spanish Succession. Treaty of Utrecht seats French prince (Philip V) on Spanish throne. *1715–74. Louis XV* debauchery at court France aids Prussia in Austrian Succession War 1756–63. Seven Years War France aids Austria against Prussia loses Canada and India to British 1774–92. Louis XVI (Marie Antoinette of Austria queen) reform measures defeated 1789–95. French Revolution Estates-General becomes National Assembly (1789) constitution accepted by king (1791) kingship abolished (1792) Louis XVI executed (1793 Reign of Terror (1793–94) Directory established (1795) 1796–99 Rise of Napoleon Bonaparte to be First Consul.	1701 Elector of Brandenburg receives title of King of Prussia. 1701–13 Austria takes part in *War of Spanish Succession.* 1713–40 Frederick William I develops Prussian army 1740–80 *Maria Theresa* queen of Bohemia and Hungary archduchess of Austria War of Austrian Succession (1740–48) 1740–86. Frederick II (The Great) seizes Silesia from Austria *and retains it* in Seven Years' War (Battles of Rossbach and Leuthen 1757) builds up Prussia in peace time. 1765–90 Joseph II emperor attempts reforms in Hapsburg lands 1790–92. Leopold II emperor	1714 Milan Naples etc given to Austria by treaty 1715 Turks drive Venetians from the Morea and *Crete.* 1735 Spanish Bourbons established in Naples 1738 Tuscany given to Francis of Lorraine (husband of Maria Theresa) 1796 Napoleon invades *Italy siege of Mantua* 1797 Cisalpine Republic set up by Bonaparte.	1701–13 England takes part in War of Spanish Succession (Blenheim 1704) 1702–14. Anne queen. *1714. George I* (Hanover) becomes king growth of cabinet government. 1741–48 England aids *Austria in Austrian Succession* War 1745 Jacobite rebellion Stuart supporters) 1756–63. Seven Years War England aids Prussia Canada acquired supremacy established in India British Empire founded 1764. Industrial Revolution begun Hargreaves invents spinning jenny 1775–83. Revolt of the American colonies. 1788 British colonisation of Australia begun	1709 Battle of Pultowa forces of Charles XII crushed by Russia. 1783–96. Catherine II empress of Russia. 1772–95. Poland partitioned among Russia Prussia and Austria.

WARS OF THE FRENCH REVOLUTION AND BONAPARTE—1792-1815

1796. Bonaparte's Italian Campaign.
1798 Egyptian expedition fails (Battle of the Nile).
1800 Napoleon's victory at Marengo.
1805. Nelson victorious at Trafalgar
1805. Bonaparte wins at *Austerlitz.*
1806 Prussia crushed at Jena.
1807 Napoleon defeats Austrians at Wagram and Russians at Friedland
1807 Peace of Tilsit hard terms for Prussia Alexander I of Russia becomes Napoleon's ally
1812 Napoleon invades Russia sack of Moscow retreats with heavy losses.
1813 Napoleon defeated in three-day battle at Leipzig
1815. Wellington victorious at Waterloo.
1815 Treaty of Vienna.

	FRANCE	GERMANY	AUSTRIA-HUNGARY	ITALY
1800	1804. Napoleon made emperor. 1814. Napoleon abdicates, returns from Elba (1815), exiled after Waterloo (1815) 1814. Bourbons restored under Louis XVIII 1824-30 Charles X; reactionary policy 1830. July Revolution; Charles X abdicates; Louis Philippe becomes king ("citizen king"). Conservative policy. 1848. February Revolution; Louis Philippe abdicates, republic proclaimed. 1848-52. Second Republic (Louis Napoleon, president). 1851. Coup d'état of Louis Napoleon, proclaimed emperor (Napoleon III, 1852-70) 1854-56. Crimean War. 1859. War with Austria in behalf of Italy 1861-67. Attempt to found a monarchy in Mexico fails (Maximilian) 1870-71. Franco-Prussian War; France loses Alsace-Lorraine. 1870. Third French Republic proclaimed 1875. Republican constitution adopted. 1891. Dual Alliance of France and Russia 1894-1906. Trials of Dreyfus for treason 1896. Annexation of Madagascar.	1806. Confederation of the Rhine formed. 1806. Holy Roman Empire dissolved. 1819. Carlsbad decrees passed by German Diet suppress liberalism. 1834. German Customs Union (Zollverein) formed, a first step toward unity. 1840-61. Frederick William IV king of Prussia. 1848-49 Frankfort Parliament to unite Germany fails, liberal uprising fails 1861-88. William I king of Prussia 1862 Bismarck becomes chief minister 1864. Schleswig and Holstein taken from Denmark by Prussia and Austria. 1866 Austro-Prussian War over Holstein. 1867-71. North German Confederation under Prussian leadership 1870-71. Franco-Prussian War. 1871. German Empire proclaimed, William I emperor, Bismarck chancellor (1871-90). 1882 Triple Alliance with Austria and Italy 1884 Germany begins African colonization. 1888-1918 William II emperor. 1899. Germany obtains Baghdad railway concession from Turkey.	1806. Holy Roman Empire dissolved; Francis II becomes Francis I of Austria. 1809 Metternich becomes minister of foreign affairs; reactionary leader of Europe (1815-48). 1815. Congress of Vienna; treaty of Vienna signed, "Holy Alliance" formed by Russia, Prussia, and Austria 1835-48 Ferdinand I; reactionary rule. 1848. Revolution expels Metternich. Francis Joseph I begins long reign. 1849 Hungarian war for independence fails (Kossuth). 1859. War with France and Italy. 1866 War with Prussia. Austria withdraws from German Confederation and loses Venetia. 1867. Dual Monarchy of Austria-Hungary established. 1876-90 Count Tisza, liberal leader, pursues policy of "Magyarization" in Hungary; economic development. 1882. Triple Alliance formed by Austria, Germany, and Italy.	1815. Italy a group of small states under Austrian domination. 1830. Revolution fails. 1859. War with Austria; Austrian control broken. 1860-61. Garibaldi conquers and unites Italy (except Rome) under Victor Emmanuel, kingdom of Italy proclaimed. 1870. Rome taken from pope and made capital 1882. Triple Alliance with Austria and Germany 1896. Abyssinia repels Italian attack at Adowa.
1900	1904. Entente Cordiale between France and Great Britain settles disputes over colonies. 1905-06. Algeciras Conference upholds French policy against Germany's challenge. 1911. War with Germany narrowly averted over Moroccan question.	1900. Great naval development begins. 1911. Enormous growth of Germany in population, industry, and trade. 1911-13. German standing army increased from 515,000 to 866,000 men. 1912. Socialists make gains in Reichstag.	1907-12 Reform blocked in Austria. 1908. Austria annexes Bosnia and Herzegovina. 1914. Archduke Francis Ferdinand assassinated in Bosnia by Serbs.	1900. Victor Emmanuel III becomes king. 1911-12. War with Turkey; Italy takes Tripoli 1912. Universal suffrage introduced.

THE FIRST WORLD WAR AND

	WESTERN FRONT	EASTERN FRONT	OTHER FRONTS AND EVENTS
1914	Aug. 24. Naval battle at Helgoland; German navy bottled up. Sept. 6-10 German invasion of France stopped at the Marne. Entrenched line established from channel to Switzerland. Oct.-Nov. Germans held at Ypres.	Aug 26-31. Hindenburg stops Russian offensive at Masurian Lakes (Battle of Tannenberg). Aug.-May, 1915 Russians invade Galicia and capture Carpathian passes. Nov.-Dec. German attacks on Warsaw fail.	July 28. Austria declares war on Serbia. Aug. 1. Germany declares war on Russia over mobilization. Aug. 3. Germany declares war on France, Russia's ally. Aug. 4. Germany invades Belgium. England declares war Aug. 23. Japan joins the Allies. Oct. 29. Turkey openly joins Germany and Austria
1915	Repeated attempts to break the line by the Allies at Neuve-Chapelle (Mar. 10); by the Germans at Ypres (Apr.-May); by the Allies above Arras (May-June); by the Germans in the Argonne (July).	May-Sept. Mackensen's drive expels Russians from Galicia. June-Oct. Austro-German drive into Russian Poland; capture of Warsaw (Aug. 5); Brest-Litovsk (Aug. 25); Vilna (Sept. 18).	Feb.-Dec. Anglo-French attacks on Dardanelles fail. May 7. Lusitania sunk; 1,198 lives lost. May 23. Italy declares war on Austria. Oct. 13. Bulgaria joins Teutonic allies. Oct.-Dec. Austro-German army conquers Serbia. Dec.-Jan., 1916. Allies abandon Gallipoli expedition.
1916	Feb.-July. Terrific German attacks on Verdun fail. ("They shall not pass".) July-Nov. Allies gain in the Battle of the Somme at heavy cost in lives.	June-Aug. Russian counterattack on Galicia. Aug.-Dec. Rumania invades Transylvania; Germans, Austrians, Bulgarians counterattack, take Bucharest, crush Rumania.	Jan.-Feb. Austro-Bulgarian invasion of Montenegro and Albania. Mar. 9. Portugal joins the Allies. May 31. Naval battle of Jutland; German fleet withdraws. Aug. 4. Italians take Gorizia (Aug. 9). Aug. 27. Rumania joins the Allies.
1917	Mar. Germans withdraw to Hindenburg Line; lay waste to country on 50-mile front. Apr.-Dec. Repeated Allied attempts to break line at Arras (Apr.-June); Vimy Ridge taken (Apr. 9-12), Allies attack along Aisne (Apr.-Nov.); in Flanders (July-Dec.); at Cambrai (Nov.-Dec.).	Mar. 15. Russian revolution destroys effectiveness of Russian army. July. Russian offensive on Eastern front fails. Sept. 3. Riga captured by Germans. (Continued on next page)	Jan. 31. Germany announces unrestricted submarine war. Feb. 3. United States severs diplomatic relations with Germany. Mar. 15. Czar of Russia dethroned; Kerensky sets up government. Apr. 6. United States enters war; Panama, Cuba, Liberia, Brazil follow. June 12. King Constantine deposed and Greece joins Allies. Oct.-Dec. Italian disaster at Caporetto; Allenby's Palestine campaign takes Jerusalem (Dec. 10).

III. MODERN HISTORY BETWEEN

WESTERN EUROPE	EASTERN EUROPE	OTHER COUNTRIES
1918. Oct. 31. Hungary declares itself independent republic. 1918. Nov. 12. Republic of Austria proclaimed. 1919. Treaty of Versailles; France regains Alsace-Lorraine. 1919. Irish declare independence. 1920 Danzig and Saar Valley put under League of Nations. 1922. Irish Free State inaugurated. 1922. Fascists control Italy, Mussolini prime minister. 1924. British Labor Government; Italy annexes Fiume. 1925. President Ebert of Germany dies; Hindenburg elected. 1926. Herriot and Poincaré premiers of France, Germany admitted to League of Nations. 1927. Italian government curbs labor. 1928. Fascist Grand Council supreme power in Italy.	1918. Republic of Poland proclaimed. 1918. Czechoslovakia established. 1919-20. Greece obtains Thrace, Smyrna from Turkey. 1921. Polish constitution adopted. 1922. King Constantine of Greece abdicates, Prince George king of Greece. 1924. Lenin dies; King George of Greece deposed and republic proclaimed. 1926. Pilsudski dictator of Poland. 1927. President Masaryk of Czechoslovakia re-elected. Socialist riots in Vienna. 1928. Trotzky banished from Russia.	1920. League of Nations established. 1920. Treaty with Yugoslavia gives Istria and Gorizia to Italy; Fiume a free state. 1921. Limitation of Armaments Conference in Washington. 1922. British end protectorate over Egypt. 1924. Pictures sent over wire and by radio 1927. Radio-telephone between England, United States. 1927. Motion pictures sent by radio ("television"). 1927. Lindbergh makes nonstop flight New York to Paris.

(Continued on next page)

ERN HISTORY (*Concluded*)

GREAT BR TA N

90 I sh Pa amen abo shed Ir h m m
bers sea ed n Br ish Parliame t. U ed K ngdom Grea Br n a d land
806. Cape Co ny cong red b g n ng o B tish ru n Sou h Af ca
8 2– 5 Wa w h he Un ed Sta es Trea of G 8 4
820-30 George V ki g.
830-3 W am V ki g
832 Reform B pob cal power to m ddl classes. Other egi lati abo sh ng la er orm g labo cond us, etc.
83 V or e beg s h ng ugn 837 90
854-56 C mean Wa w h Russia
85 Ind an Mut ny E tish governmen assumes ru e of dia 858
8 Second par iamentary rm act po t-cal power tended to wo k ngmen b gi ning democra c ru e
868- 4 First ministry of G ads one Liberal)
0 B g ng of Home Ru e agita
8 4–80 D ra mmis ry Cons rva e
82 B ish up Eg p
9– 902 Boer Wa Un on o Sou h Afr ca rmed 909

902 T ans S Da an a oad pened
90 –05 Ru so- apanese Wa
905 Russ an Revo u on b gins first D ma m ts 90
907 Ang o-Russ agreem nt.

90 0 Edward VI k g
Commonwea th of Austra a ormed
907 Ang o-Russ an ag eemen ov Pers a.
9 0–36 George V k ng
9 Power of House of Lords m ed
9 4 I sh Home Ru e B passed suspended

RUSS A

0 2 A exand I mpero
809 Russia gains F nla d af war wi h S eden 80 –09
S 5 Csar gra ts a const tion to P land
825–55 N ho as I mp or
830–32 Revo tu n P land is Po and mad Russ an pro n e
854 56 C mean War west rn powers aga Russia Peac P ris 85
8 5–8 A exander mp ro
86 C ses R sa an ser s
53 Po h n frec pp ess d
8 8 Russo-Tu k h Wa
A d assass ed
8 94 A e ande p u tro g e ary po icy
8 D a A e wi h Fra
894 9 N h as ercises ab u sm ppress on inte ect pr gress.
899 Finnish ns n bro g ed.

TURKEY AND THE BALKANS

8 2 Wa o Greek nde-*pendence (Phil llenic m ve-*men Lord Byro G eece g ns nd end e 829
28 29 Russo Tu k sh Wa (Treaty Ad anop e Gre k Ind p d k ow dg d M d a and Wa a h a par tial depe d
8 0 S rb a ures autonomy
83 –62 O to Hous of B va in king G eece
854–5 C mean War West-rn P wers aid Turk against Russia
66 Rumani e rmed as If g vern g tate b u M d via d W llachia Ch es I, 66– 9
8 8 Russo Tu k sh Wa g P evna, 8 7) T ea es Sa S ano nd Ber n m k S ia h enegro a d Ru-n ni nd pe den Bulgaria part l to m us.

909–09 *S ccessful revolution n Turkey by Young Turks.*
9 2 Turco- ta ian War
9 2 3. Ba kan Wars B lkan allies conquer most o Turkey in Europe

OTHER COUNTR ES AND GENERAL PROGRESS

nd tr a R vo on Th application *of steam power pens u w ers*
80 S eamboa *v established b* Fu ton
830 d penden monarchy estab shed B g ium Leo d I 833–65
930 Man hes and Li erpoo rail ad pe ed Baltimo and Ohi railroad begun
83 Pa gran ed to S F B Morse or tromag egraph
840 Ch na opened oreig ers.
854. Japanes ports opened ore gn rs
859 Transa an tel graph cab e laid
8 9 Pub ca on of Char es Darw n's Orig n Spec es se ting f rth doc-tri of uti
864 B ginning of n erna ona Red Cross.
869 Suez Cana opened
8 5 C n F State rmed
894–95 War between Ch na and apan E pans on of apan begins
89 F s Hague Pea e Conference
899 W re ess egraphy by Marconi be wee ra e a d England

90 First airp ane flight, by Wrigh broth rs
905 Un on of Sweden and Norway d s-so ed.
907 Second Peace Con erence at Th Hague.
9 0 Portugal becomes repub ic
9 2. Repub ic proclaimed in Ch na
9 4 Panama Cana opened to raffi

THE PEACE SETTLEMENT—See Also Chronology in Fact Index

	WESTERN FRONT	EASTERN FRONT	OTHER FRONTS AND EVENTS
	Con nued f om p e ed ng page)		
1918	M Jul German d es stopped Picard (Mar 2 Lys Ri Apr 9 Aisn and Marn Ma 27) Oise (9 Marn (ul 5 ul 9 A sd coun e offe s e begun s ond b tle o h Somme Aug 8 Am r-*icans take St. Mihiel p Meuse-*Argonne attack (Sep N H ndenburg L ne b oken Oct) G rmans dr n rom Belgium S pt No Germans surrender on Arm st ce Day Nov	*sn F b B esk p e Russ s* Finland L uan Ukra Crimea, Armenia, Si ria up depend g rnm ts M 3 R es a epts h m hati g pea e o B e -L tovs Mar Germany moves forces to west pt Allies d Bulgarian armies n Allied a, a d B ga ia sues or pea e Oct Nov M enegro and Serb a eco ered b Allies.	an 8 Pres dent W son lays d wn his Fourteen Po nts. pt 30 Bu ga ia s gns armis ice. Oct. 30 Turkey s gns arm stice N 3 Austr a s gns arm stice Nov 9 Po sh repub announ ed N 0 G rman mp ro fl es to Holland abd ca es Nov 28 N Germany s gns arm st ce. 2 Emperor Cha es abdica es Austrian thro N U gary King*d m of Serbs, Cro ts, and S ov es* Yugo slavia established

THE PEACE SETTLEMENT

1919 n. 8 Pea e Con ere e f 27 Allied and Associa d P w rs me s Versa es Tr es drawn p w h fi e my nati ns.
28 T eaty w h Germany gn d a V rsa es cludes Co ena he League of Na o s G rmany oses h overseas col n es, Alsace Lorra e, parts o Posen a d Wes Pr ssia, and ss Europ err ries armam ed red para n tl m und rtaken Ratified by all h Pow rs e cept th U ted Sta es, whose S a e ja ta th tr ty *N 9, 9 9 and Mar 9 9 0*
S pt. 0 T eaty w h A st a signed S G rm n Aus ia ed ed rom 5 000 to 32 000 squa mi es, and rom 30 000 000 to 8,500 000 popul ti n by territorial ssion to Czec o-S ovakia H gary P la d R mani Serb a, and ta
Nov 2 T ea y w h B ga a sign d N y B lgar loses h con esta B lkan Wars f 9 2– 3 and of th World War to Rumania, Serb a, and Gre e

1920 J 4 Treaty w th Hungary signed a T anon. H garian boundaries established w th rritorial co ess ns to Rumania, J g -Slavia, and other border states.
A g 0 Treaty w h Tu key g ed Sev es Turk oses half her pop ti n and wo-th rd of h territory h Stra ts intern tionali ed mu h of Asi T key distrib ed am g he P wers as mand tories. N ra ified b Tu key placed in 23 by T eaty of Lausanne.

TWO WORLD WARS

WESTERN EUROPE	EASTERN EUROPE	OTHER COUNTR ES
Con nued f om p e eding page		
929 taly ends quarre w th pope Va can Sta e estab shed 32. Br nd Fra dies Pree d n D mer assass ed su ceded by Lebrun Hindenburg re-e ected Presiden of German 933. Nazi Revo ut on in Germany H er becomes Chance or *Th rd Re h* G rma y ea es Leagu *N tions.* 934. H nd burg d es H er sup eme n Germany 935 Th Saar re rns G many ta y attacks E h opia in war of conq est.	928–29 Russ begun F e Year Plan f ndustry and arming 930 Caro o Ruma ia esumes throne. 933 D lfuss makes Austria semi-fascist 9 4 Russia adm ted to Leagu of Nations King Alexander of Yugoslavia assassinated 935 Marshal Pilsudski o Poland d es. *M* onarchy restored in Greece.	928 Many nations sign Kellogg-B and peace pact. 929 German d rigibl Graf Zeppe n, fl es arou d the world. 93 Spain becomes repub ic King Alfonso flees. 93 –32 J pan sets up new state of Man h kuo. 933 United States recogni es Soviet Russia. J pan announces withdrawal from League of Nations. 934 Leopold III king of Belgium Chancellor D ll uss of Austria assassinated by Nazis. 935 Transpacific a routes established League f Nati ns sanctions against taly fail.

MODERN HISTORY BETWEEN TWO WORLD WARS *(Concluded)*

WESTERN EUROPE	EASTERN EUROPE	OTHER COUNTRIES
1936. George V of England dies; Edward VIII abdicates after 11 months; George VI becomes king. 1937. Chamberlain English premier. Germany aids Spanish fascists. 1938. Germany annexes Austria; France and England abandon Czechoslovakia by accepting Munich Pact with Germany. 1939. England and France guarantee Polish independence.	1936. New Russian constitution. 1937. Russia aids Spanish loyalists. 1938. Czechoslovakia loses one third of area to Germany, Poland, Hungary. 1939. Russia signs nonaggression pact with Germany.	1936–37. Civil war in Spain. Transatlantic airplane service begins. 1936. Italy annexes Ethiopia. Germany reoccupies Rhineland; Italy, Germany, Japan combine against Communism. 1937–38. Japan attacks China in undeclared war. 1938. Austria becomes a German state. 1939. Italy annexes Albania. Germany seizes all of Czechoslovakia. Fascists win Spanish civil war.

THE SECOND WORLD WAR — See Also Chronology in Fact-Index

	EUROPE AND AFRICA	PACIFIC OCEAN AND ASIA (Dates Refer to Local Time)
1939	Sept. 1. Germany invades Poland. Sept. 3. Britain, France declare war. Sept. 17. Russia occupies East Poland. Sept. 27. Warsaw surrenders to Germans. Oct. 14. German U-boat sinks British battleship Royal Oak. Nov. 4. Roosevelt signs Neutrality Act. Nov. 30. Russia invades Finland. Dec. 2. Russia captures Finnish port of Petsamo. Dec. 17. Germans scuttle Admiral Graf Spee in harbor of Montevideo, Uruguay. First Canadian troops land in England.	"Undeclared war" continues between China and Japan.
1940	Mar. 2. Russians crack Finnish defense. Mar. 12. Finland and Russia sign peace treaty. Apr. 9. Germany occupies Denmark, invades Norway. May 3. Allies evacuate Norway. May 10. Germany invades Belgium and Netherlands. May 14. The Netherlands surrenders. May 28. King Leopold surrenders Belgian army to Germans. May 29–June 4. British and French troops flee from Dunkirk to England. June 5. Battle of France begins. June 9. Norway surrenders; British withdraw from Narvik. June 10. Italy declares war on France and Britain. June 14. Germans enter Paris. June 22. France signs armistice with Germany. Aug. 8. Germany begins air attack on England. Aug. 25. First British planes bomb Berlin. Sept. 27. Japan joins Rome-Berlin Axis. Oct. 6. Germany ends large-scale daylight raids on England. Oct. 10. Germany occupies Rumania. Oct. 27. DeGaulle sets up "Free French" government. Dec. 9. British strike back at Italians in Egypt.	"Undeclared" Chinese-Japanese war continues.
1941	Feb. 5. British drive Italians from Egyptian Sudan. Apr. 3. British yield Bengasi, Libya, to Axis attack. Apr. 30. British forces leave Greece. June 22. Germany invades Russia. Italy declares war on Russia. Oct. 31. U-boats sink U.S. destroyer Reuben James off Iceland. Nov. 22. Germans take Rostov, key to Caucasus. Dec. 11. Germany, Italy declare war on United States. United States declares war on Germany, Italy.	July 21. French give military control of Indo-China to Japan. Oct. 18. Tojo appointed premier of Japan. Nov. 20. Japanese submit "last proposals" to United States. Dec. 6. Roosevelt appeals to Hirohito to intervene for peace. Dec. 7. (Dec. 8 in Far East.) Japanese attack Pearl Harbor, Wake, Guam, Philippines, Hong Kong; invade Siam. Dec. 8. United States declares war on Japan. Dec. 23. Wake Island surrenders to Japanese.
1942	Jan. 29. German Afrika Korps recaptures Bengasi, Libya Mar. 28. British Commandos raid U-boat base at St. Nazaire. May 12. Russia counterattacks on Kharkov front. July 1. British stop German drive in North Africa at El Alamein. Aug. 24. Nazis advance on Stalingrad in Russian Caucasus. Nov. 8. American troops invade North Africa. Nov. 14. Allied troops enter Tunisia. Nov. 27. French scuttle fleet at Toulon to prevent Axis seizure.	Jan. 2. Japanese enter Manila. Jan. 23. Japanese invade Solomons, capture Rabaul on New Britain. Feb. 15. Singapore falls to Japanese. Apr. 18. Doolittle fliers from Hornet raid Tokyo. June 3–6. Japanese invade Aleutian Islands; Americans repel attack on Midway. July 21–22. Japanese land at Gona and Buna in New Guinea. Dec. 9. Allies take Gona in northern New Guinea.
1943	Jan. 18. Russian army lifts siege of Leningrad. Feb. 2. Russians defeat Germans at Stalingrad. May 12. German resistance ends in North Africa. July 9–10. Allies invade Sicily. Sept. 3. Allies invade southern Italy. Oct. 1. Allies take Naples; Germans retreat to Volturno River. Oct. 13. Allies force Germans from Volturno defenses. Nov. 6. Red army liberates Kiev during winter offensive.	Feb. 8. U.S. forces completely occupy Guadalcanal. Mar. 2–4. Allies bomb Japanese convoy in Bismarck Sea. May 30. Americans capture Attu in the Aleutians. Aug. 5. Americans take Munda on New Georgia Island. Aug. 25. Japanese evacuate New Georgia. Sept. 16. MacArthur's forces capture Lae, New Guinea. Nov. 24. Americans conquer Tarawa and the Gilberts. Dec. 26. Marines land at Cape Gloucester, New Britain.
1944	Jan. 22. Allies land at Anzio beachhead in Italy. May 9. Russians recapture Sevastopol after 24-day siege. May 18. Allies capture Cassino. June 4. American 5th Army enters Rome. June 6. Allies invade France at Normandy coast. Aug. 15. Allied armies invade southern France. Aug. 25. Americans march into Paris. Sept. 5. Russia declares war on Bulgaria. Nov. 22. American 3d Army takes Metz. Dec. 16. Germans counterattack in Ardennes (Battle of the Bulge).	Feb. 1. Americans land on Kwajalein in Marshall Islands. Apr. 3. American forces occupy Bikini atoll. June 15. U.S. Marines invade Saipan in the Marianas. July 21. American Marines invade Guam. Sept. 15. U.S. Marines invade Pelelin in the Palaus. Oct. 20. Americans begin Philippine campaign; invade Leyte. Oct. 23–26. American Navy defeats Japanese in Leyte Gulf. Dec. 15. U.S. forces invade Mindoro in Philippines. Dec. 26. MacArthur announces end of resistance on Leyte.
1945	Jan. 17. Red army takes Warsaw. Jan. 20. Hungary signs armistice with Allies. Mar. 7. Americans cross Rhine River. Apr. 8–13. Russians capture Vienna. Apr. 21. Russians enter Berlin. Allies take Bologna, Italy. Apr. 22. British enter Hamburg. Apr. 26. British capture Bremen. Apr. 29. Germans in northern Italy surrender. May 2. Berlin surrenders. May 4. Nazis surrender Denmark, Netherlands to British. May 7. Germans surrender unconditionally at Reims.	Jan. 9. Americans invade Luzon in Philippines. Feb. 4. Americans enter Manila. Feb. 15. Americans land on Bataan Peninsula in Philippines. Feb. 19. U.S. Marines land on Iwo Jima, conquer island Mar. 16. Apr. 1. U.S. Army, Marines land on Okinawa. June 21. Americans complete conquest of Okinawa. July 5. MacArthur announces final liberation of Philippines. Aug. 6. American fliers drop atomic bomb on Hiroshima. Aug. 8. Russia declares war on Japan. Aug. 27. American occupation force enters Japan. Sept. 2. Japan surrenders aboard U.S.S. Missouri in Tokyo Bay.

RECONSTRUCTION AFTER THE WAR

WESTERN EUROPE	EASTERN EUROPE	OTHER COUNTRIES
1946. Fourth French Republic proclaimed. Allies and Russia occupy Germany, Austria. Italy becomes a republic. 1947–48. Britain grants Indian independence; Moslem state of Pakistan created. 1949. Ten democracies of western Europe ratify North Atlantic Treaty with Canada and United States. 1950. Western Europe gets arms from United States for defense against Communism. Eisenhower named commander. 1951. United States troops go to Europe as defense force. 1952. George VI of Great Britain dies; succeeded by elder daughter. Elizabeth II crowned 1953. 1953. European Coal and Steel Community begins work. 1954. Spain receives first armament in pact with United States.	1946–47. Russia opposes U.S., Britain, France in postwar policies; begins "cold war." 1947. Poland elects Russian-dominated government. 1947–48. Greek government forces fight Communist guerrillas in north. 1949. Tito of Yugoslavia defies Russia. 1950. Communist-controlled Eastern Germany recognizes Poland's postwar frontiers. 1951. Yugoslavia gets American arms. 1952. Turkey, Greece join the NATO. 1953. Stalin, premier of Russia, dies. 1954. Tito "re-elected" Yugoslav president.	1946–48. Disorder and civil war in Palestine, China, French Indo-China, East Indies. 1947. King Michael of Rumania abdicates in favor of Communist-dominated government. 1948. Mohandas Gandhi assassinated in India. 1949. Chinese Communists overrun China. Palestine becomes Israel and Arab State. 1950. Communist North Korea invades South Korea. Chinese "volunteers" aid Communists against United Nations. 1951. Iran nationalizes oil industry. 1952. Argentina creates a syndicalist province. 1954. Japan, U.S. sign mutual defense pact.

PERIOD OF DISCOVERY—1000-1500

1000 — 1000. Northmen discover America. — 1497 John Cabot discovers Newfoundland.

FRENCH RULE

1500

1534. Cartier coasts along Newfoundland, explores the St. Lawrence (1535-1540)

1600

1604 Port Royal (Annapolis, Nova Scotia) first permanent French settlement founded.
1608. Quebec settled by French colonists led by Champlain.
1610 Hudson discovers Hudson Bay while searching for the Northwest Passage. England claims Hudson Bay region.
1613 English colonists from Virginia capture Port Royal. Quebec captured by the British (1629). New France and Acadia restored to the French by the treaty of St. Germain (1632).
1615 Champlain explores Lake Huron.
1623-32 War between English and French. English attack Acadia (Nova Scotia), capture Quebec. Canada restored to France by treaty.
1627 St. Lawrence valley granted to Richelieu's company of One Hundred Associates", control New France (1627-63).
1642. Montreal founded by Maisonneuve as a religious colony.
1658-60 Groseilliers and Radisson reach the Mississippi and Great Plains.
1663 Charter of the company of One Hundred Associates revoked. New France a royal colony.
1666 Allouez founds a mission on Lake Superior.
1670 Hudson's Bay Company founded in England to carry on trade in the new territory.
1672 Frontenac becomes governor of Canada.
1673. Marquette and Joliet discover the Mississippi.
1682. La Salle descends the Mississippi and takes the country for France.
1688-97 "King William's War", Acadia captured by the British, attack on Quebec fails, conquest restored at the Peace of Ryswick (1697).

1700

1701 Detroit founded as French post, Forts Frontenac and Duquesne, and other posts on the British frontier follow.
1701-13. "Queen Anne's War" Unsuccessful attack on Quebec. Acadia seized, France cedes Hudson Bay region, Newfoundland and Acadia to Great Britain (Treaty of Utrecht 1713).
1743 The Verendryans reach the foothills of the Rocky Mountains.
1744-48. "King George's War" Louisbourg captured by English colonists (1745), restored to French by treaty of Aix-la-Chapelle.
1749 English settlement of Halifax founded, colonization of Nova Scotia begins.
1755-63. "French and Indian War" French deported from Nova Scotia (1755). British under Wolfe capture Quebec (1759), New France ceded to England by Peace of Paris (1763).

ENGLISH PERIOD

1774. Quebec Act passed by British Parliament to organize government for Canada.
1775-83. American Revolution. Loyalists flee to Canada, colonists attack on Quebec repulsed.
1791 Canada divided into Upper and Lower Provinces by the Constitutional Act passed by British Parliament, popular assemblies established with limited powers.
1793 Sir Alexander Mackenzie reaches the Pacific Ocean.

1800

1812-15. War with the United States. American attempts to invade Canada repulsed, surrender of Detroit (1812), naval battle of Lake Erie (1813).
1812-20 Earl of Selkirk founds settlement in Red River Valley.
1837-38. Rebellions against officialdom. French Canadians led by Papineau attempt to found a republic in lower Canada. William L. Mackenzie heads armed rebellion in Upper Canada.
1838 Lord Durham sent out from England to determine conditions in Canada, famous report to colonial office leads to changes in Canadian policy.
1840 Act of Union joins the two provinces under a royal governor.
1842 Webster-Ashburton treaty between Great Britain and United States settles Maine boundary dispute.
1854. Reciprocity treaty with the United States abrogated by United States (1866).
1858 Capital removed to Ottawa.
1864 Quebec Conference held to consider question of confederation.

DOMINION PERIOD

1867 British North America Act establishes the Dominion of Canada (Confederation of Ontario, Quebec, New Brunswick, Nova Scotia) with self-government.
1867 Conservative government organized by Sir John Macdonald (premier 1867-73, 1878-91).
1869. Hudson's Bay Company's land purchased by Canadian government.
1870 Rebellion of Red River half-breeds against extension of Dominion control over Manitoba led by Louis Riel. Province of Manitoba formed.
1871. Treaty of Washington between Great Britain and the United States provides for the settlement of the Nova Scotia fisheries dispute and the Oregon boundary question.
1871 British Columbia joins the Union.
1872 Anti-Unionist agitation in Nova Scotia ended by defeat of the party in general elections.
1873 Prince Edward Island admitted to the Union.
1873 Conservative government overthrown because of Canadian Pacific Railroad scandal. Alexander Mackenzie forms Liberal government.
1878 Conservatives restored on protectionist platform.
1885 Riel leads half-breed rebellion in Saskatchewan to obtain squatter rights.
1885. Canadian Pacific Railroad finished.
1893 Bering Sea controversy with the United States settled.
1896 Conservatives defeated on question of reestablishment of Roman Catholic schools in Manitoba.
1896-1911 Sir Wilfrid Laurier premier (Liberal).

1900

1903 Alaskan boundary dispute settled.
1905 Alberta and Saskatchewan organized as provinces.
1914-18 First World War (see separate outline)
1921 W. L. Mackenzie King premier after Liberal victory in general election.
1930 Richard B. Bennett premier after Conservative victory.
1935 Lord Tweedsmuir governor-general. *Liberal victory* makes Mackenzie King premier.
1939 British King and Queen make good-will tour. Canada enters second World War.
1940 Mackenzie King government returned in general election. Earl of Athlone governor-general.
1944-45 Mackenzie King government re-elected, General Sir Harold Alexander governor-general.
1948. St. Laurent succeeds Mackenzie King as premier.
1949 Newfoundland becomes Canada's tenth province. Canada gains right to amend constitution.
1950 Canada's Supreme Court replaces British Privy Council as Canada's final tribunal.
1952. First native governor-general, Vincent Massey. 1954—joins Geneva conference on Asian problems.

OTHER COUNTRIES

1515-47 Francis I king of France.
1539-43 De Soto's expedition in southern United States.
1555-64. Coligny attempts to found Huguenot colony in Florida.

1607 Jamestown, Virginia, settled by English colonists.

1618-48. Thirty Years' War in Europe.
1620. Plymouth Colony founded by English Puritans.

1643-1715 Louis XIV king of France.

1688 William III of Orange ascends English throne.
1689-97 War of Louis XIV over succession in the Rhenish Palatinate.
1699 French settle in Louisiana.

1701-13. War of the Spanish Succession in Europe.
1702-14. Anne queen of England.
1727-1760 George II king of England.

1740-48 War of the Austrian Succession.

1756-63 Seven Years' War in Europe.

1789-95 French Revolution.
1792-1815 Wars of the French Revolution and Napoleon.

1803 *United States buys Louisiana territory from France.*
1832. Parliamentary Reform Act passed by the British Parliament.
1837 Victoria ascends the British throne.

1846 Boundary between the United States and Canada settled at 49th parallel.

1861-65. Civil War in the United States.

1866 Atlantic cable laid.

1870-71. Franco-Prussian War.

1887 First British Colonial Conference.

1899-1902. *Boer War in South Africa.*

1901 Commonwealth of Australia formed.
1914 Panama Canal opened.
1926 Imperial Conference creates British Commonwealth of Nations.
1939 War breaks out in Europe.
1941 United States joins Canada in mutual defense pact.
1945 United Nations established.
1947 India divided into independent India (Hindu) and Pakistan.
1951 Baudouin I succeeds Belgian throne.
1954 United States explodes H-bomb.

PERIOD OF DISCOVERY—1000-1600

1000

1000. Leif the Lucky (Northman) discovers America.
1492. Columbus discovers America.
1497. John Cabot discovers Newfoundland, etc.
1513. Ponce de Leon discovers Florida.

1513. Pacific Ocean discovered by Balboa.
1519–21. Conquest of Mexico by Cortez.
1528–36. Narvaez and De Vaca explore the Gulf Region.
1534–43. Cartier discovers and explores the St. Lawrence.

FOUNDING OF THE THIRTEEN COLO

VIRGINIA

1600

1607. Jamestown founded (first permanent English settlement). Captain John Smith.
1611–16. "Dale's Rule."
1619. House of Burgesses meets (first representative assembly in America).
1619. First negro slaves introduced.
1624. Virginia becomes a royal colony.
1642. Berkeley becomes governor.
1652–58. Self-government under the Protectorate.
1676. Bacon's rebellion.
1693. William and Mary College founded.

1700

1710–22. Spotswood governor.

MARYLAND

1632. Maryland granted to Lord Baltimore.
1634. St. Mary's settled by English Catholics.
1647. Representative assembly established.
1649. Act of toleration for all Christians passed.
1691. Maryland becomes a crown colony.
1729. Baltimore founded.

NEW YORK

1609. Hudson discovers the Hudson River.
1614. Dutch trading post established on Manhattan Island.
1626. New Amsterdam founded.
1629. Patroon system organized.
1638. Swedes settle along the Delaware.
1655. Dutch seize Swedish colony.
1664. New Amsterdam captured by English fleet, becomes New York.
1683. First assembly in New York.
1688. New York united to New England under Andros.

NEW JERSEY

1664. New Jersey granted to Berkeley and Carteret.
1674. Colony divided into East and West Jersey.
1682. Penn purchases East Jersey.
1702. Two Jerseys reunited as a royal province.

DELAWARE

1623–64. Dutch and Swedes settle west side of Delaware Bay and River.
1682. Delaware included in Penn's grant.
1703. Delaware becomes a separate colony.

MASSACHUSETTS

1620. Pilgrims land at Plymouth. ('Mayflower' ...)
1623. New Hampshire settled at Dover.
1630. Boston (Massachusetts Bay Colony) founded.
1636. Roger Williams expelled from Salem.
1636. Harvard College founded.
1643. New England Confederation formed.
1645. Free school at Roxbury.
1652. Massachusetts extends control over Maine.
1675. King Philip's War in New England; Indian uprising against settlers suppressed.
1680. New Hampshire separates from Massachusetts.
1684. Massachusetts charter annulled.
1686. Andros becomes governor of New England.
1691. Plymouth unites with Massachusetts.
1692. Salem witchcraft cases.

NEW HAMPSHIRE

RHODE ISLAND

1636. Roger Williams founds Providence.
1638. Newport settled.
1663. Rhode Island obtains a charter.

CONNECTICUT

1633. Fort ... built.
1636. ... settled.
1637. Pequot War.
1638. New Haven founded.
1662. Charter granted by ...
Connecticut ...

STRUGGLE BETWEEN FRANCE AND GREAT BRITAIN FOR SUPREMACY IN

1689–97. King William's War: New England colonists under Sir William Phips seize Port Royal, Acadia; attack on Quebec fails; Peace of Ryswick restores conquests on each side (1697)
1701–13. Queen Anne's War: frontier raids by French and Indians (Deerfield, 1704; Haverhill, 1708); English capture Port Royal; expedition against Quebec unsuccessful. France cedes Hudson Bay region, Newfoundland, Nova Scotia (Acadia) to Great Britain (Treaty of Utrecht, 1713).
1744–48. King George's War: Colonists capture Louisburg (1745); ... France by Treaty of Aix-la-Chapelle (1748).
1755–63. French and Indian War: expedition against Fort Duquesne fails; ...

CONFLICT BETWEEN COLONIES AND PARLIAMENT—

1763. British ministry adopts rigid colonial policy; Navigation Acts restricting colonial commerce to England strictly enforced; renewal of Sugar Act taxing importations from foreign colonies.
1764. Stamp Act resisted in the colonies. Virginia resolutions (1765); ... Congress protests against colonial policy (1765); Act repealed.
1767. "Townshend Acts" to enforce trade laws and taxing tea, paper, etc. ... riot (1770); Boston Tea Party (1773).

REVOLUTIONARY WAR—1775-1783

1775. Skirmishes at Lexington and Concord; Capture of Ticonderoga and Crown Point; Battle of Bunker Hill.
1775. Second Continental Congress meets.
1776. British evacuate Boston; naval attack on Charlestown fails.
1776. July 4. Declaration of Independence adopted.
1776–77. Washington retreats across New York and New Jersey (Battles of Long Island, White Plains, Trenton, and Princeton).
1777. British attempt to cut the colonies in two: Burgoyne's and St. Leger's campaign from Canada fails (Oriskany, Bennington, Saratoga). Howe's campaign against Washington (Battle of Brandywine, occupation of Philadelphia, Germantown).
1777. Congress adopts Articles of Confederation (ratified by states, 1777–...
1777–78. Washington winters at Valley Forge.
1778. France recognizes independence of the colonies; arrival of French ... under Rochambeau.
1778. British evacuation of Philadelphia and retreat toward New York ... mouth).
1778–79. George Rogers Clark marches through Illinois territory, ... Kaskaskia and Vincennes.
1779. British defeat Americans and French near Savannah; British occupy ...
1779. Naval battle between the 'Bonhomme Richard' and the 'Serapis' ... Paul Jones).

CRITICAL PERIOD—1783 TO 1789

1785. Maryland and Virginia delegates meet at Alexandria to consider commercial relations of the two states.
1786. Annapolis Convention to consider commerce of the country calls general convention at Philadelphia.
1786–87. Shays' rebellion in Massachusetts, caused by heavy taxes and ... poverty, suppressed with difficulty.
1787. Northwest Ordinance organizes government in the Northwest Ter...

De Soto discovers the Mississippi River
Coronado explores the Southwest.
Spanish found St. Augustine.
Raleigh attempts to establish a settlement on Roanoke

IES

OTHER EVENTS IN NORTH AMERICA

Port Royal founded (first permanent French settlement)

Quebec founded by Champlain.

Hudson discovers Hudson Bay. England claims the Hudson region.

Marquette and Joliet explore the Mississippi

La Salle descends the Mississippi to its mouth.

Detroit founded as French fort and trading post.

French settle New Orleans.

CAROLINA

Charter for Carolina granted Lord Clarendon and

Fundamental constitution drawn up by John Locke.

Charleston settled

PENNSYLVANIA

1681 Charter for Pennsylvania granted to William Penn

1682. Philadelphia founded

Overthrow of proprietary government.

Division into North South Carolina.

NORTH CAROLINA

NORTH CAROLINA

GEORGIA

1733. Georgia settled by Oglethorpe.

1752. Georgia royal colony

ORTH AMERICA—1689 1763

defeat) expedition against French at Crown Point of Lake George, 1755) capitulation of French frontier (Duquesne Frontenac etc.) capture of Quebec by 1759 France cedes Cape Breton Canada, etc. to Britain (Treaty of Paris 1763)

763 1774

Boston Port Bill closing the port and other acts to punish achusetts.

First Continental Congress draws up Declaration of Rights.

British victory at Camden.

War in the South Charleston captured by the British of King's Mountain Cowpens Guilford Eutaw Corn retreats to the north

Siege of Yorktown surrender of Cornwallis.

Evacuation of Savannah and Charleston hostilities cease.

Treaty of Paris Great Britain recognizes the independence the colonies.

Federal Constitution framed by the Constitutional Convention ratified by 11 states by end of 1788

		OTHER COUNTRIES
1789	1789–97 *George Washington, President; John Adams, Vice-President.* 1789 First Congress meets at New York. State, Treasury and War departments organized. 1789 First 10 Amendments to the Constitution adopted by Congress and sent to states. 1790 First census; population, 3,929,214. 1790 *National debt funded*; state debts assumed by federal government. 1790–95 Indian war in the Northwest Territory 1791 First national bank chartered by Congress. 1791 Vermont admitted; Kentucky (1792); Tennessee (1796) 1793. Eli Whitney invents the cotton gin 1794 Genet, minister from France, recalled for unneutral acts. 1794 Whisky rebellion in western Pennsylvania against internal revenue law 1794. Jay treaty of amity and commerce with Great Britain.	1789. *French Revolution* begins. 1793 War between France and England 1793–94. Reign of Terror in France
1797	1797–1801 John Adams, President (Federalist); Thomas Jefferson, Vice-President (Democrat-Republican) 1797 *X Y Z Affair* with France leads to naval war; Alien and Sedition Acts passed against French partisans. 1798. Virginia and Kentucky resolutions directed against Alien and Sedition Acts assert right of nullification. 1798. Eleventh Amendment adopted. 1800. Presidential election; Republicans, holding democratic ideas of strict construction and states rights, defeat aristocratic Federalists advocating strongly centralized government. 1801 John Marshall made Chief Justice	1799 Napoleon made First Consul.
1801	1801–09 Thomas Jefferson, President (Democratic-Republican); Aaron Burr (1801–05); George Clinton (1805–09), Vice-Presidents. 1801–05 War with Tripoli; end of tribute to Barbary states. 1803 Ohio admitted 1803. Louisiana Purchase from France extends U. S. boundary to Rockies. 1804 Twelfth Amendment provides separate ballots for president and vice-president. 1807 Fulton's steamboat makes successful trial voyage. 1807 Dispute with Great Britain over neutral commerce and the impressment of seamen (Chesapeake Affair) 1807–09 Embargo against Great Britain and France in retaliation for their blockade of European ports. 1808. Importation of slaves prohibited.	1804. Napoleon becomes emperor 1806 *Napoleon establishes Continental (paper) Blockade.* 1806 England issues Orders in Council blockading French territories.
1809	1809–17 James Madison, President (Democratic-Republican); George Clinton (1809–13); Elbridge Gerry (1813–17), Vice-Presidents. 1811–14 Indian war in the West (Tippecanoe) 1812. Louisiana admitted; Indiana (1816) 1812–15 *War with Great Britain*: Unsuccessful invasions of Canada (1812–1814); British take Washington (1814); Battle of New Orleans (1815); Numerous naval duels; Perry's victory on Lake Erie (1813); Treaty of Ghent 1814 1814. Hartford Convention protests against embargo and war 1816. Second national bank chartered. 1816. Mildly protective tariff passed.	1810–25 Spanish and Portuguese colonies in Central and South America become independent. 1815 Battle of Waterloo. 1815 Treaty of Vienna; Holy Alliance formed
1817	1817–25 James Monroe, President (Democratic-Republican); D. D. Tompkins, Vice-President (1817–25) 1817 Mississippi admitted; Illinois (1818); *Alabama (1819); Maine* (1820); Missouri (1821) 1817 Seminole Indian War in Florida. 1818. Great Britain and the *United States agree upon joint* occupation of Oregon territory 1819 Florida acquired from Spain. 1820. Missouri Compromise on question of slavery in territories. 1823. Monroe Doctrine advanced against the aggression of the Holy Alliance in America. 1824. Protective tariff passed. 1824. Internal Improvements Bill passed.	1821 Russia attempts to restrict trade on North Pacific coast.
1825	1825–29 John Quincy Adams, President (Democratic-Republican); John C. Calhoun, Vice-President. 1825 Erie Canal completed. 1828 "Tariff of Abominations" tariff becomes a live issue.	

		OTHER COUNTRIES
1829	1829–37. Andrew Jackson, President (Democrat). John C. Calhoun (1829–33), Martin Van Buren (1833–37), Vice-Presidents.	
	1829. "Spoils system" appointments to office.	
	1830. Webster-Hayne debate on "state rights."	
	1830. Baltimore and Ohio Railway opened, first steam locomotive in America.	
	1831. William Lloyd Garrison establishes The Liberator, a journal advocating abolition of negro slavery.	1830. Independent monarchy established in Belgium.
	1831. McCormick invents the reaper.	1830. Louis Philippe ascends French throne.
	1832. New tariff bill reduces duties but retains principle of protection.	1832. English parliamentary Reform Bill passed.
	1832. South Carolina passes ordinance "nullifying" the tariff, Jackson's proclamation denounces nullification; "Force Bill" passed (1832); Compromise tariff (1833), nullification ordinance repealed.	
	1832. Jackson reëlected, system of national nominating conventions begins.	
	1832–37. Jackson's war on the National Bank: act for renewal of charter vetoed.	
	1835–42. War against Seminole Indians in Florida.	1835. Texas secedes from Mexico and establishes an independent state.
	1836. Arkansas admitted; Michigan (1837).	
	1836. "Specie circular" issued requiring the payments for public lands to be made in specie.	
1837	1837–41. Martin Van Buren, President (Democrat); R. M. Johnson, Vice-President.	1837. Queen Victoria of England begins her long reign.
	1837. Financial panic, due to over-speculation and unsound financial policies.	
	1840. Independent treasury established.	
	1840. "Hard cider" campaign results in a Whig victory.	
1841	1841. William Henry Harrison, President (Whig); John Tyler, Vice-President.	
	1841. Death of Harrison.	
	1841–45. John Tyler, President (Whig).	
	1841. Tyler vetoes bill to reëstablish the national bank (1841) and bill for a "Fiscal Corporation"; break between Tyler and the Whigs; entire cabinet resigns.	
	1842. Webster-Ashburton treaty with Great Britain settles the Northeast boundary dispute.	
	1842. Dorr Rebellion in Rhode Island secures liberal constitution.	
	1844. First telegraph, between Washington and Baltimore, completed.	
	1844. James K. Polk (Democrat) elected President.	
	1845. Texas annexed to the United States; Florida admitted.	
1845	1845–49. James K. Polk, President (Democrat); George M. Dallas, Vice-President.	
	1846. Iowa admitted; Wisconsin (1848).	
	1846. Northwest boundary line settled at 49th parallel by treaty with Great Britain.	
	1846. Low tariff enacted.	1846. Great Britain repeals corn laws; free trade established.
	1846–48. Mexican War. American victories at Buena Vista (1847); Cerro Gordo (1847); capture of Mexico City (1847). Treaty of Guadalupe Hidalgo (1848), Mexico relinquishes claims to Texas; cedes New Mexico and Upper California to United States.	
	1846. Wilmot Proviso prohibiting slavery in territories acquired from Mexico defeated.	
	1848. Territory of Oregon organized without slavery.	1848. Revolutions in France and Italy; second French Republic founded.
	1848. Presidential election results in Whig victory. Formation of the Free Soil Party.	
1849	1849–50. Zachary Taylor, President (Whig); Millard Fillmore, Vice-President.	
	1849. Rush of gold seekers to California.	
	1850. Clayton-Bulwer treaty with Great Britain provides that neither country should have exclusive control over any canal built across Nicaragua or Panama isthmus.	
	1850. Death of President Taylor.	
	1850–53. Millard Fillmore, President (Whig).	
	1850. "Clay's Compromise": California admitted as a free state; other territory acquired from Mexico left open to slavery; slave trade abolished in the District of Columbia; new Fugitive Slave Law enacted.	
	1850. Maine adopts prohibition.	
	1851. Rail connection established between New York City and Lake Erie at Buffalo.	
	1852. 'Uncle Tom's Cabin' published; stimulates growth of abolition sentiment in North.	1852. Louis Napoleon proclaimed emperor of France.
	1852. Franklin Pierce (Democrat) elected president.	
1853	1853–57. Franklin Pierce, President (Democrat); William R. King, Vice-President.	
	1853. Gadsden Purchase settles boundary dispute with Mexico.	
	1854. Kansas-Nebraska Bill repeals Missouri Compromise and organizes Kansas and Nebraska on the principle of "squatter sovereignty." Civil war in Kansas between free state and slave state settlers (1855–57).	1854–56. Crimean War.
	1854. Treaty with Great Britain establishes reciprocity with Canada.	
	1854. Admiral Perry secures the opening of Japanese ports to foreign trade.	
	1854–55. "Know Nothing" Party, a secret party opposed to foreigners participating in American politics, at the height of its power.	
	1854–55. Movement to add slave territory to the United States; Ostend manifesto favors annexation of Cuba (1854); filibustering expedition to Nicaragua (1855).	
	1856. First Republican national convention adopts anti-slavery platform.	
1857	1857–61. James Buchanan, President (Democrat); J. C. Breckenridge, Vice-President.	
	1857. Dred Scott decision maintains that neither negro slaves nor their descendants can become citizens, that a slave does not become free by being carried to free territories.	
	1858. Minnesota admitted; Oregon (1859); Kansas (1861).	
	1859. John Brown's raid on the United States arsenal at Harper's Ferry.	
	1860. Abraham Lincoln (Republican) elected president; South Carolina secedes from the Union.	1861. Italy united under Victor Emmanuel.
	1861. Ten other Southern States secede and form the Confederacy.	
1861	1861–65. Abraham Lincoln, President (Republican); Hannibal Hamlin (1861–65), Andrew Johnson (1865), Vice-Presidents.	1861–88. William I king of Prussia.
	1861–65. Civil War.	1863–67. Maximilian attempts to found monarchy in Mexico.
	1861. Apr. 12. Fort Sumter fired upon by the Confederates.	
	1861. July 21. Union army defeated at Bull Run.	
	1861. Seizure of Confederate commissioners (Mason and Slidell) from British steamship nearly leads to war.	
	1862. Apr. 6–7. Grant's victory at Shiloh; McClellan's peninsular campaign (Mar.–July); naval battle (Mar. 9) between Monitor and Merrimac; New Orleans captured by Farragut (Apr. 25).	
	1862. Slavery abolished in the District of Columbia.	
	1863. Jan. 1. Lincoln issues the Emancipation Proclamation.	
	1863. July 1–3. Union victory at Gettysburg; Vicksburg captured (July 4).	
	1863. West Virginia admitted as a free state.	
	1864. Grant made commander-in-chief of the Union armies. Sheridan's raid up the Shenandoah Valley; Sherman's march to the sea; capture of Mobile.	
	1864. Nevada admitted.	
	1864. Lincoln reelected.	
	1865. Apr. 9. Lee surrenders at Appomattox Court House.	
	1865. Apr. 14. Lincoln assassinated.	

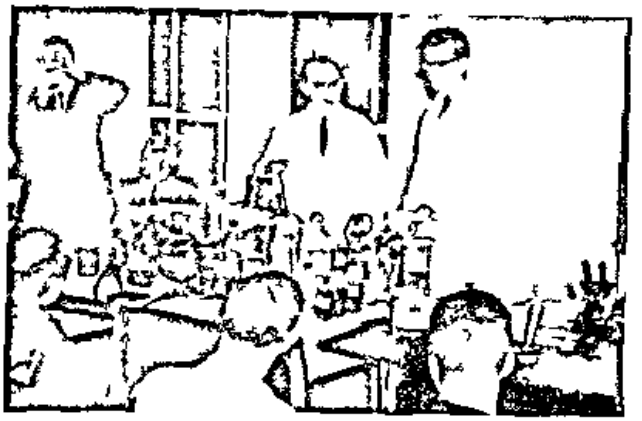
		OTHER COUNTRIES
1865		
	1865–69 **Andrew Johnson**, *Presiden (Repu li* an adm ns rat on but J hnson a Democrat)	1866. Austro-Prussian War
	1865 Pro lamat on extending amnesty to the South (14 classes excepted	1868 Permanent Atlantic cable laid
	1865 **Thirteenth Amendment** prohibits slavery n the United States	
	1865–67 President quarrels with Congress over the *recons ruction* policy Congress passes over his veto *Civil Rights Bill* to extend c tizenship to freedmen 1866) act cont nuing **Freedmen s Bureau** *Reconstruct* on Act (1867) and **Tenure of Office Bill** *(1867)*	
	1867 Alaska purchased from Russ a Nebraska *admitted* to the Union	
	1867 Johnson forces French to withdraw army from Mexico	*1867* Dual monarchy of Austria-Hungary established.
	1868 Presidential impeached conviction fails by one vote two-thirds of Senate required)	
	1868 **Fourteenth Amendment** extends citizenship to freedmen	
1869		
	1869–77 **Ulysses S Grant**, President (Republican) **Schuyler Colfax** (1869-73) **Henry Wilson** (1873–77) Vice-Presidents	*1869* Suez Canal opened
	1870 **Fifteenth Amendment** extends franchise to the negroes.	1870–71 Franco-Prussian War
	1 1 **Treaty of Washington** w th Great Britain provides for a clearer defin tion of the Oregon boundary settlement of disputes over the Canadian fisheries and a bitration of the Alabama claims	1870 Third French Republic proclaimed.
	1872 **General Amnesty Act** restores most of the ex-Confederates to their c vil and polit al rights	1870 Union of Italy completed
	1872 Grant *reelected* **National Reform-Labor Party** adopts platform of labor and economic reform **Prohibition Party** names presidential candidates	*18 1* German Empire established
	1873 Financial panic	
	1873 Grant vetoes bill to increase paper money Congress decides to resume specie payments (1875)	
	1872–74 Political scandals *"Credit Mobilier"* implicates public men in Union Pacific scandal, **"Salary Grab Act** greatly increas ng congressmen s salaries (1873) **Whiskey Ring** conspiracy to defraud government of internal reven ue on distilled liquors *(18 4)*	
	1876 Colorado admitted	
	1876 Election returns disputed commiss on declares Republican candidate elected (Rutherford B Hayes)	
	1876 Custer Ind an massacre in Montana.	
	1876 Alexander Graham Bell nvents the tel phone	
1877		
	1877–81 **Rutherford B Hayes**, President (Republican **William A Wheeler** Vice-President.	
	1877 **Federal troops withdrawn from the South**	
	1877 Railroad and miners strikes contribute to widesp read industrial depression	*1877 79* Russo-Turkish War
	18 8 **Greenback Party** favoring cheap money at h ght of power	
	8 8 **Bland-Allison Act** for purchase and coinage of silver passed over Hayes veto	
	1879 Specie payments resumed	
	1879 Thomas A. Edison invents the ele tric l ght	
	880 Hayes fa ls of renomination because of his differences with party pol t cians.	
1881		
	1881 **James A Garfield** President (Republican) **Chester A Arthur** Vice-President.	
	1881 Garfield assassinated (July 2)	
		1882 Triple Alliance formed between Germany Austria, and Italy
	1881–85 **Chester A Arthur** President (Republican)	
	1883 Pendleton Civil Service Reform Bill passed	1884. Partition of Africa
	1884 Civil government established in Alaska	
	1884 Bitter pres dential election campaign independent Republicans (Mugwumps) swing to Democratic support.	
1885		
	1885–89 **Grover Cleveland**, Pres dent (Democrat) **T A Hendricks**, Vice-Pres dent.	
	1885 Immigration of contract laborers forb dden	*1888–1918.* William II emperor of Germany
	1887 **Interstate Commerce Act** passed beginning of national reg lation of railroads	
	888 Bill for tariff for revenue only fails to pass Congress	
	1889 **Department of Agriculture** established	
1889		
	1889–93 **Benjamin Harrison** President (Republican) **Levi P Morton** Vice-Pres dent.	
	1889–90 Admission of North and South Dakota, Idaho Montana Washington and Wyoming	
	889 Oklahoma thrown open to settlement.	
	1890 McKinley tariff establishes protectionist principle.	
	890 Sherman Anti-Trust Act passed to prevent monopolies by corporations	
	1890 Silver Purchase Act provides for monthly purchase of silver to be paid for in treasury notes	
	1890 Controversy with Germany over the Samoan Islands settled by the Treaty of Berl n	1891 Dual Alliance of France and Russia announced
	1891 People s Party (Populists) formed	
	1892 Cleveland (Democrat) elected again on tariff issue	
	1892–1896 Development of the automobile.	
	1893 Bering Sea controversy with Great Br ta n referred to arbitration	
1893		
	1893–97 **Grover Cleveland** President (Democrat) **Adlai E Stevenson** Vice-Pres dent	
	1893 Financial panic Silver Purchase Act repealed and gold standard supported	
	1894 Ta ff duties reduced Pullman ra lroad strikes suppressed by Federal troops	
	895 United States demand for arb tration of British Venezuelan controversy acceded to by Great Br tain	
	896 Utah admitted to the union	
1897		
	1897–1901 **William McKinley** Pres dent (Republ an) **Garret Hobart** (1897–1901) **Theodore Roosevelt** (1901) Vice-Presidents	1897 Marconi perfects the wireless telegraph
	1897 Dingley tariff reestablishes high protection	
	1898 United States battleship Ma ne blown up in Havana harbor	
	1898. Spanish American War Spanish fleets destroyed at Man la Bay and Santiago invasion of Cuba. Spain recognizes Cuban independence Pue to R co, Guam and the Philippines ceded to United States Cuba occupied by United States until 1902	
	1899 Samoan Islands d vided with Germany	
	1898 Hawaii annexed to the I nited States Samoan Islands d vided with Germany	*1899–1902* Boer War in South Africa.
	1899 Insurrection in the Philippines suppressed civil government estab shed	1899 First Hague Peace Conference
	1899 Secretary Hay obtains recogn tion of the "Open Door" policy toward China	*1900* Boxer uprising in China
	1900 Currency law adopts gold standard McKinley reelected on the full dinner pail platform	
	1901 McKinley assassinated (Sept. 6	

		OTHER COUNTRIES
1901	1901–9. Theodore Roosevelt, President (Republican); Charles W. Fairbanks, Vice-President (1905–9). 1901. Hay-Pauncefote treaty with Great Britain allows United States to build Panama Canal on condition that it be open to all nations on equal terms. 1902. French interests in Panama Canal purchased; canal zone obtained from Panama by treaty (1904). 1903. Alaskan boundary dispute with Great Britain settled. 1903. Beginning of stricter government regulation of transportation and trade; Department of Commerce and Labor created, railroad rebates abolished (1903); jurisdiction of Interstate Commerce Commission extended (1905); suits brought against trusts under Sherman Anti-Trust Law; Hepburn Act regulating railroad rates passed (1906); Meat Inspection and Pure Food Acts passed (1906). 1903. Development of democratic government; state-wide primary election law in Wisconsin followed by widespread adoption in other states; initiative and referendum adopted by Oregon (1902). 1903. Wright brothers make first airplane flight at Kitty Hawk, N. C. 1905. Intervention in Santo Domingo to establish financial responsibility. 1906–9. Intervention in Cuba to restore order following armed revolt. 1907. Oklahoma admitted as a state.	1901–10. Edward VII king of England. 1902. Trans-Siberian railway opened. 1903. Panama declares itself an independent republic; immediate recognition by President Roosevelt. 1904–1905. Russo-Japanese War; mediation of Roosevelt results in the Peace of Portsmouth. 1907. Second Hague Peace Conference. 1907. Triple Entente formed between Great Britain, France, and Russia. 1908–1909. Naval Conference at London adopts rules for naval warfare.
1909	1909–13. William Howard Taft, President (Republican); James S. Sherman, Vice-President. 1909. Dispute with Venezuela arbitrated. 1909. Payne-Aldrich tariff passes; rules of the House of Representatives reformed. 1910. Postal savings bank created; parcel post, 1912. 1911. Bills for tariff reductions vetoed by President. 1912. Panama Canal Tolls Act exempts American coastwise shipping from tolls. 1912. Arizona and New Mexico admitted as states; territorial government established in Alaska. 1912. Taft renominated; Progressive party nominates Roosevelt; Woodrow Wilson, Democrat, elected. 1913. Sixteenth Amendment gives Congress power to levy income tax.	1909. Peary reaches North Pole. 1910. George V king of England. 1911. Revolution in Mexico; Diaz resigns. 1911–12. War between Italy and Turkey in Tripoli. 1911. Amundsen reaches South Pole. 1912–13. Turkish-Balkan wars. 1912. Chinese republic proclaimed.
1913	1913–21. Woodrow Wilson, President (Democrat); Thomas R. Marshall, Vice-President. 1913. Seventeenth Amendment provides for election of senators by the people. 1913. Underwood-Simmons tariff lowers duties; Federal Reserve system of banks created. 1914. Federal Trade Commission created; Clayton Anti-Trust Act passed, graduated income tax law passed. 1914. Panama Canal Tolls Act repealed; canal opened. 1914. Dispute with Mexico over "Tampico incident"; American troops occupy Vera Cruz. 1914. Neutrality in European war proclaimed. 1916. Tariff Commission created; Adamson Law establishes eight-hour day for railway employees. 1916. Punitive expedition sent into Mexico. 1916. Wilson re-elected on a peace platform. 1917. War declared against Germany (see Chart III for First World War). 1918. Republican Congress elected. 1918. Armistice signed by Germany (see Chart III for First World War). 1919. Eighteenth Amendment establishes nation-wide prohibition. 1919. Treaty of Versailles fails to receive two-thirds majority in the Senate. 1920. Nineteenth Amendment establishes nation-wide woman suffrage.	1914. Direct wireless communication established between Germany and United States. 1914–18. First World War. 1917. Denmark sells Virgin Islands to United States. 1919. Treaty of Versailles signed. 1919. First transatlantic flights, both airplane and dirigible. 1920. League of Nations established.
1921	1921. Warren G. Harding, President (Republican); Calvin Coolidge, Vice-President. 1921. Budget Bill passed establishing budget system in national finance. 1921. Treaty with Colombia ratified paying her $25,000,000 to settle Canal Zone dispute. 1921. Bill passed greatly restricting immigration. 1921. President signs joint Congressional resolution declaring peace with Germany and Austria (July 2). 1921–22. Limitation of Armament Conference at Washington prepares Four Power Treaty between U. S., Great Britain, France, and Japan, for maintaining peace in the Pacific, and Five Power Naval Treaty between U. S., Great Britain, France, Italy, and Japan limiting naval tonnage. 1922. Strikes of coal miners and railroad shop workers keep a million men idle. 1922. Fordney-McCumber Tariff Act passed, raising duties to high level. 1923. President Harding dies (Aug. 2).	1921. Famines in Russia and China. 1921. Ex-Emperor Charles unsuccessfully attempts to regain throne of Hungary; exiled to Madeira. 1922. European economic conference, including German and Russian delegates, at Genoa. 1922. Tomb of King Tutankhamen of Egypt (about 1350 B. C.) discovered near Luxor.
1923	1923. Calvin Coolidge, President (Republican). 1924. Investigation of leasing of government oil reserves to private interests creates national scandal. 1924. Immigration law passed limiting immigration to 2 per cent of foreign-born of each nationality here in 1890; Japanese exclusion provision creates intense feeling in Japan. 1924. Soldiers' bonus bill passed over President's veto; taxes reduced. 1924. Army aviators make round-the-world flight. 1924. Coolidge re-elected; Charles G. Dawes, Vice President. 1927. Greatest Mississippi River flood ever known causes immense crop and property losses. 1925. Secretary of State Kellogg negotiates "Pact of Paris" by which nations renounce war.	1926. Pilsudski sets up dictatorship in Poland. 1926. British dominions recognized as autonomous units in the empire. 1927. Acute conflict between Mexican government and Church; controversy with United States over oil and land laws. 1927. United States intervenes to end civil war in Nicaragua.
1929	1929. Herbert Hoover, President (Republican); Charles Curtis, Vice-President. 1929. President calls special session of Congress to consider problems of farm relief and changes in the tariff. 1929. President Hoover appoints Federal Farm Board. 1929. World-wide economic depression begins; stock markets collapse; banks fail; millions unemployed. 1930. Hawley-Smoot bill raises tariff. 1931. Democratic House elected; John N. Garner of Texas, speaker. 1932. Relief measures to meet depression adopted.	1929. Byrd flies over South Pole. 1929. Tacna-Arica boundary settled. 1930. United States, Great Britain, and Japan agree on new naval reductions at London Naval Conference. 1931. Great Britain drops gold standard. 1931–32. Japan invades Manchuria, sets up Manchukuo.
1933	1933. Franklin D. Roosevelt, President (Democrat); John Nance Garner, Vice-President. 1933. Congress enacts first "New Deal" program (NRA for business, AAA for agriculture; abandonment of gold standard); Soviet Russia recognized. Prohibition (18th) amendment repealed. 1935. Congress passes Wagner Labor Act and Social Security Act. Huge appropriations for work relief. Supreme Court kills NRA. Philippine independence voted. New neutrality policy established. 1936. Supreme Court kills AAA. Veterans' bonus paid. Roosevelt and Garner re-elected. 1940. Huge rearmament program, peacetime conscription, adopted; 99-year leases for American bases in British possessions in Western Hemisphere. 1940. Roosevelt re-elected with Henry A. Wallace, Vice-President. 1941. Lend-lease aid enacted. Japanese attack Pearl Harbor; U. S. goes to war against Japan, Germany, and Italy. (Reference-Outline for World War, Second summarizes American action in the war.) 1944. Roosevelt elected for fourth term, with Harry S. Truman, Vice-President.	1934. Nazi policies disturb Europe; Chancellor Dollfuss of Austria, King Alexander of Yugoslavia assassinated. 1937–38. Japan conquers much of China. 1938. Germany annexes Austria and most of Czechoslovakia. 1940–41. Twenty-one American republics resolve to act jointly for defense of Western Hemisphere. 1942. Twenty-six United Nations pledge mutual assistance against Axis.
1945–1954	1945. Roosevelt dies (April 12), Truman is president; 1947—Army, Navy, Air Force put under one Cabinet member; 1945—Congress cuts income taxes, votes ERP; Truman re-elected, A. W. Barkley, vice-president. 1949. United States signs North Atlantic Treaty; 1950—sends arms to non-Communist nations; hydrogen bomb ordered; forces aid South Korea; 1951—sends troops to guard Western Europe; aids Nationalist China on Formosa. 1953. Dwight D. Eisenhower, Republican, inaugurated president; Richard Nixon, vice-president. 1954. Increased aid to French forces in Indo-China in effort to keep Southeast Asia from Communism.	1945. Second World War ends. 1946–47. Allies draft peace treaties with Finland, Bulgaria, Hungary, Rumania, Italy. 1951. France promotes Schumann Plan. 1952. Japan signs peace treaties. 1954. Army ousts Paraguay's president.

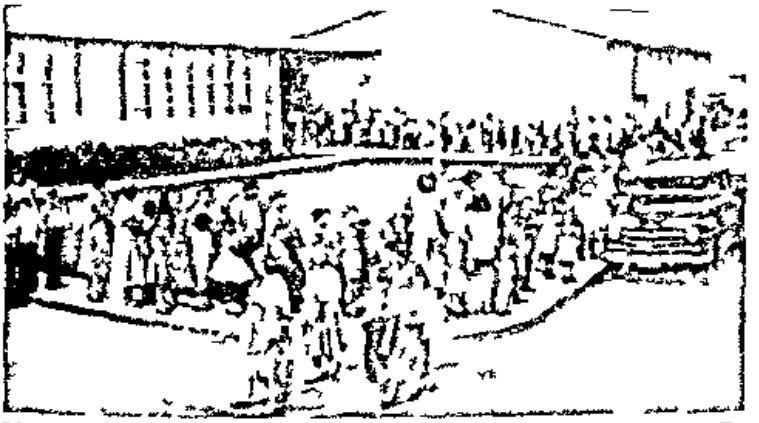
REFERENCE-OUTLINE FOR CURRENT EVENTS



Dr Jonas Salk second left is with President Eisenhower and Secretary Hobby At right are Mrs Salk and their three small sons



Dr Salk left describes his antipolio vaccine to reporters in his Pittsburgh laboratory The Salk vaccine was world wide news



Mass inoculation began in 1955 but was stopped after some children contracted polio After new checks the program resumed



Dwight David Eisenhower II the president s grandson was one of the first vaccinated He grins with a lollypop after his shot.

THIS OUTLINE is designed to give the student the teacher, and the general reader a clear and orderly review of the chief events and trends of our time In so doing it promotes one of the chief aims of education today, which is to train people to understand the responsibilities of this critical period

Common sense tells us that we cannot form intelligent opinions or plan our lives effectively without a general knowledge of what is going on in the world around us This knowledge is not easy to get however The textbooks summarizing and explaining today s history are still to be written Press and radio overwhelm us hour by hour with a confusing mass of *facts* reports and comments The impact of today s headlines blurs the memory of what happened yesterday

This outline is offered as a guide in the maze It presents no completed picture but merely traces the general pattern of history in the making

The page references are keys to the vast amount of new material added to these volumes year by year in the various fields that are affected by the march of our civilization Thus the outline not only covers political events and advances in science and industry but it also presents an organized view of the social cultural and economic developments of the day

To make relationships clear the outline goes back in many instances as far as World War I Its arrangement *is* intended to focus attention primarily on current events and problems—on what may be called the world s unfinished business

STRUGGLE FOR WORLD MASTERY—DICTATORSHIP VERSUS DEMOCRACY

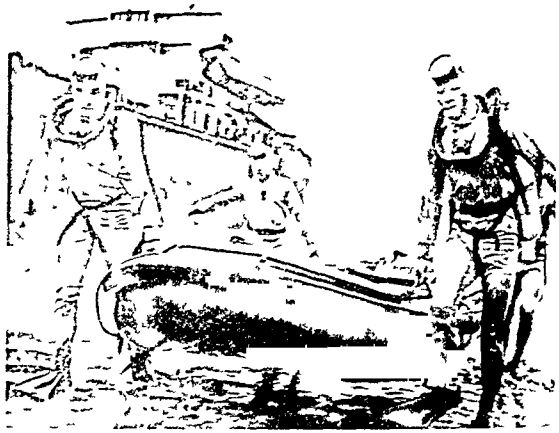
EUROPE IN CRISIS

I ORIGINS OF CRISIS IN WORLD WAR I W 239-44 E-434 See also the Reference-Outlines for Europe and United States History

A Revision of frontiers W 239-40
1 Rise of new states Czechoslovakia *C-535-6* Finland F-70 Yugoslavia Y-346-7 Poland P-344 Estonia E-400 Latvia L-135 Lithuania L-276
2 States reduced in areas W 239-40 Germany G-98 Austria A-493 Hungary H-450 Bulgaria B-349 Turkey T 220a

B Immediate consequences of the war W 245-7
1 Bolshevik Revolution in Russia *R 288-9*
2 Unrest in the British Empire Ireland I 230b Egypt E-278 India I-68
3 Fascist regime in Italy I 274-5 M-474 F-43
4 Large national debts and reparations W 239 241-3 F 269 270 E-3 0, G 38





UNITED STATES GUARANTEES PROTECTION OF FORMOSA

Chinese junks sail near the Formosa Strait under the wing of a U. S Navy patrol plane Naval planes kept watch on all coastal ships as tension mounted over Red China's claims to Formosa

Chinese Nationalist frogmen beach their rubber raft after a defense drill off the island of Matsu. Nationalist forces were largely trained by United States military and naval advisers.

5 Dislocation of trade within new frontiers W-243, D 18, B-349
6 Problems of racial and religious minorities M-7, Y-346-7, R-253, C-536, P-344, J-354

II. CRISIS DEVELOPS E-435-6, W-244, 245-8
A. World depression: acute unemployment E-370; rebirth of economic nationalism I-196, L-371
B. Rise of dictatorships D 88-9. Communist Russia R-288-9, C-426 (Lenin L-162, Stalin S-360); Fascist Italy I-274, F-43 (Mussolini M-474); Nazi Germany G-98-9, F-44 (Hitler H-383); Fascist Spain S-322*a* (Franco F-277)

III. FAILURE OF DIPLOMATIC EFFORTS
A. Ineffectiveness of arbitration A-294-5
B. Washington Conference on limitation of naval armaments (1921–22) H-267
C. China's sovereignty guaranteed H-267, C-281-2
D. Kellogg-Briand Treaty (1928) C-468
E. Hoover's peace efforts H-421
F. Roosevelt's "good neighbor" policy R-210-11
G. Roosevelt advocates "quarantine" of aggressor nations W-247
H. Collapse of the League of Nations and the Versailles Treaty W-244, G-99, J-321, L-142: Europe rearms W-244, P-102, G-99, F-272, I-275

IV. FASCIST AGGRESSION (1931–39) E-435-6, W-246-7
A. Germany, Italy, and Japan form powerful anti-Comintern alliance E-435, G-99, J-321
B. England and France adopt "appeasement" policy E-436, L-371, F-272, C-183
C. Japan conquers Manchuria (1931–32) and invades China (1937) J-321, C-283, P-14, M-76
D. Italy conquers Ethiopia (1935–36) and invades Albania (1939) I-275, E-435, L-403, A-138
E. Fascists victorious in Spanish civil war (1936–39) S-322*a*, E-436, I-275, F-277
F. Hitler's Germany dominates continental Europe G-98-9: reoccupies Rhineland (1936) G-99; annexes Austria (1938) A 495; annexes Czechoslovakia (1939) C-536; takes Memel from Lithuania (1939) G-99; signs nonaggression pact with Russia (1939) W-247, G-99, R-291

WORLD WAR II BEGINS IN EUROPE

I. WAR SPREADS OVER EUROPE W-247-58
A. Britain and France declare war after Nazis invade Poland W-247-8, L-371, F-272
B. Poland conquered and partitioned by Germany and Russia W-248, P-345
C. Winter of 1939-40: active war at sea, but deadlock on land W-248-9
D. Russia extends its rule in the Baltic W-249
E. Spring and summer 1940: Germany sweeps across western Europe W-250-1, maps W-256: Denmark and Norway occupied W-249-50, D-71-2, N-304*b*-5; Belgium, Luxemburg, and Netherlands conquered W-250, B-117, L-354, N-122, Italy joins Germany in war I-275; France surrenders F-272
F. Battle of Britain W-251-2, E-371-2
G. Axis drive in Balkans W-255, B-26-7: Rumania and Bulgaria occupied R-254, B-350; Greece and Yugoslavia conquered G-194, Y-347

II. WAR IN AFRICA AND NEAR EAST W-257: British win in Syria and Iraq W-257; back-and-forth struggle over Libya and Egypt W-255, 257, 260, 263-4

III. RUSSIAN THEATER OF WAR W-257-8, 261-2, 264-6, 268-9

WAR SPREADS TO THE PACIFIC

I. BACKGROUND IN THE FAR EAST P-14-19, A-419. great reserves of raw materials A-416-17, C-272, I-63, L-205-7; vast market provided by Asia's millions A-417, problem of overpopulation A-402, 415-16, growth of foreign domination P-13-14, C-280, objections to foreign control C-281-2, J-320-1, I-68-68*a*

II. MANY-SIDED STRUGGLE FOR POWER P-14
A. Major western interests in the Far East A-419: Britain in India, Ceylon, and Burma I-68-68*a*, C-180, B-361; France in Indo-China I-125, Netherlands in East Indies E-208-9, J-325, I-126; United States in Philippine Islands P-201-2







EXPERIMENT AND DEVELOPMENTS IN UNITED STATES WEAPONS

At left the Navy s ' Flying Platform an experimental helicop ter is airborne A ducted fan powers it by air jets The p lot steers by shifting his balance At center crewmen of the atomic submarine *Nautilus* are at diving stat ons for the successful 1955 undersea trials At right smoke trails from the Air Force s electronically gu ded rocket Falcon as it hits a drone bomber

B Russia in Asia Siberia S-172-5 Outer Mongolia M 341-5 Russian Turkestan T 214
C Japan s growing strength J 321 P 14 19
D China under the Republic C 281-3 C 228

III CONFLICTS IN THE FAR EAST P 14 19 W 252-3
A Western powers try to curb Japan J 321 Washington and London Conferences P 14
B Antagonism between Japan and Russia J 321 R 296 anti Comintern pact P 435-6
C China and Japan conflict J 321 C 283 Japan conquers Manchuria (Manchukuo M 76 outbreak of undeclared war in China (1937) C-283 W 252
D Japan seeks to dominate Greater East Asia J-321 secures military control of French Indo-China W 258 I-125 joins New Order alliance with Germany and Italy W 252-3

THE HARD ROAD TO VICTORY

I JAPAN STRIKES AT THE UNITED STATES AND THE BRITISH EMPIRE J 321 2 W 259 key positions in southwest Pacific captured W 260-1 Japanese onrush checked W 261, 262-3

II ALLIES COUNTERATTACK IN PACIFIC Guadalcanal captured victorious campaign in New Guinea, Japanese driven from Aleutians W 262-3

III ALLIES INVADE NORTH AFRICA DRIVE GERMANS FROM TUNISIA, CAPTURE SICILY AND INVADE ITALY W 263 4

IV CLOSING IN ON JAPAN AND GERMANY W 267 71
A Americans press closer to Japan—invasion of the Philippines W 267-8
B Victory in Italy—capture of Rome W 269
C Americans invade northern France W 269 rout Germans and capture Paris W 270 F 2 3 battle of the Bulge W 270 282

V GERMANY AND JAPAN COLLAPSE W 271 2
A Americans cross Rhine and join Russians to force German surrender W 271 Russians take Berlin B 130 occupation of Germany W 272 G 100
B Defeat and surrender of Japan—Iwo Jima and Okinawa captured atomic bombs dropped on Hiroshima and Nagasaki Japan surrenders W 272

Note A pictorial history of the specific campaigns and battles of the war will be found on pages W 276-93

STRUGGLE FOR WORLD PEACE

I DIPLOMATIC NEGOTIATIONS DURING AND AFTER THE WAR
A Atlantic Charter drawn up W 297
B International conferences at Casablanca, Cairo Tehran Yalta and Potsdam W 297 9 R 292 pictures R 212 N 191
C Atlantic City (UNRRA) and Bretton Woods (currency stabilization) conferences W 297

II UNITED NATIONS FORMED—DUMBARTON OAKS AND SAN FRANCISCO CONFERENCES W 298, U 240-3 organization U-240-240b

III HARDSHIPS AND PROBLEMS AFTER THE WAR
A Cost in human life and money W 294-5
B Losses in normal production W 295
C Social and political unrest W 297 299 See also the Reference-Outline for World *History*
D Domestic problems T 198 200-1 reconverting war industries to civilian production T 197 8 housing and food shortages T 198 200 200b W 299b mounting labor strife T 197-8 foreign policy T 197, 198 200 200a W 299b

IV REALIGNMENT OF WORLD POWER Asiatic demands for independence W 299 E-200 F 267 I 127, I 68a B-319-20 weakness of Britain and France W 299a E-372 F-273 E-437, Russian imperialism W 299b E-437 R 292

V DIFFICULTIES OVER PEACE TREATIES W 299b treaties with minor Axis states W 299b-300 problem of Germany W 300 Moscow Conference to discuss German Austrian treaty W-300

VI THE RISING TIDE OF COMMUNISM: see the Reference-Outline for World History

CHANGING CONDITIONS IN THE UNITED STATES

AFTERMATH OF WORLD WAR I

I. UNITED STATES WITHDRAWS FROM EUROPE U-386: Wilson's peace program fails W-148-9; Harding elected on anti-League of Nations platform H-266

II. IMMEDIATE EFFECTS OF WORLD WAR I
- A. United States becomes world's chief creditor nation I-194
- B. Growth of nationalism: drastic restriction of immigration I-17; high protective tariff restored H-267
- C. Experiment with prohibition P-416

III. FROM PROSPERITY TO DEPRESSION U-386-8
- A. Business booms under Coolidge C-467-8
- B. Boom collapses during Hoover administration U-387-8: conditions leading to depression H-422-3; Hoover's relief measures H-423

THE "NEW DEAL"

I. DEMOCRATS VICTORIOUS R-203, U-388

II. FRANKLIN ROOSEVELT'S "NEW DEAL" PROGRAM R-204-10
- A. Measures intended for immediate relief: bank holiday proclaimed B-52, R-204; gold standard abandoned R-207, M-339; direct aid to unemployed R-206, 209, emergency farm relief F-20; assistance to industry R-206
- B. Efforts to achieve far-reaching reforms
  1. Plan to regulate industry (NRA) R-206
  2. Long-range farm program A-68, F-20
  3. Protection of savings and investments: insurance of bank deposits B-51; supervision of security issues and stock exchanges S-100
  4. "Managed currency" policy M-339, R-207
  5. Social security—old-age benefits and unemployment compensation S-218-218*a*, picture R-207
  6. Low-cost housing and slum clearance B-345, H-432*e*
  7. Labor legislation—regulation of wages and hours of work and guarantee of right to collective bargaining R-206, 208, 209, 210, L-72
  8. Education and training of youth (CCC and NYA) R-206, 209
  9. Experiment in social and economic planning (TVA) T-69, R-207
- C. Rejection of plan to reorganize Supreme Court R-209-10
- D. New power of organized labor L-72

III. FOREIGN TRADE POLICY: Reciprocal Trade Agreements Act of 1934 R-210, I-195, T-17; World Economic Conference R-207

IV. ROOSEVELT'S RE-ELECTION FOR THIRD AND FOURTH TERMS R-213, 218: foreign affairs overshadow national issues R-213, 218

THE UNITED STATES IN WORLD WAR II

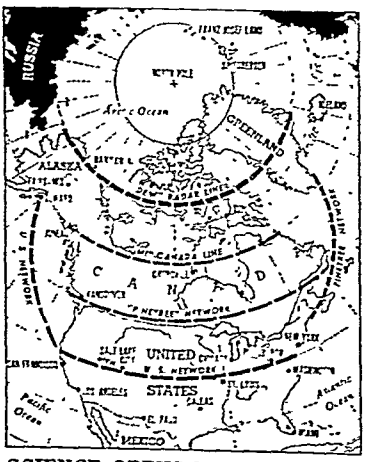
I. NEUTRALITY AND DEFENSE
- A. Experience in World War I W-233-4
- B. Disarmament after World War I H-267
- C. New policy of strong defense: neutrality policy before and after outbreak of war R-211-13, U-388-9; abandonment of "isolationism" U-388, W-253-4; huge rearmament program launched W-253, R-212; new military and naval bases W-253-4, P-63, C-122, A-138, N-82

II. MEETING THE THREAT OF WAR: "arsenal of democracy" U-388-9; leasing British naval bases W-253; Joint Defense Board with Canada C-90, R-212-13, peacetime conscription R-212; lend-lease aid to other nations R-213, U-389, W-254

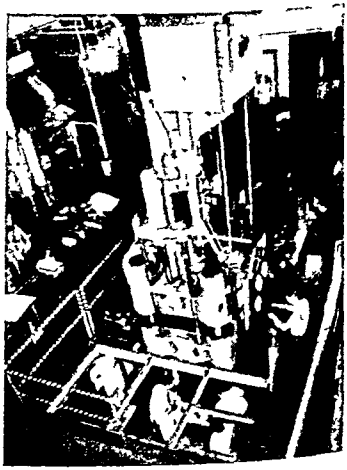
III. THE UNITED STATES AT WAR: see the Reference-Outline for United States History, section World War II (1941–45); and the war chronology in the Fact-Index

AFTERMATH OF WORLD WAR II

I. TRUMAN SUCCEEDS ROOSEVELT R-218, T-196: difficulties encountered in reconverting to peacetime







SCIENCE OPENS NEW FRONTIERS IN DEFENSE AND INDUSTRY

The heavy broken arc lines on this map show the automatic radar warning network of the United States and Canada. The network will detect an air attack from offshore or from the Arctic Circle.

In center are the first man-made diamonds in history. General Electric scientists produced them in 1955 in the 1,000-ton press at right. Pressure was over 1,500,000 pounds per square inch.

production—labor disputes and strikes shortages T 197 U 392 changing foreign policy T 198 200-200a new labor legislation L-72 3 T 198

II CONSEQUENCES OF THE WAR W 294-6 gains in science and technology W 296 domestic difficulties W 299b differences with Russia W 293b 300 T 200a R-292 292a

III TRUMAN DOCTRINE AND MARSHALL PLAN T 198 U-393-4

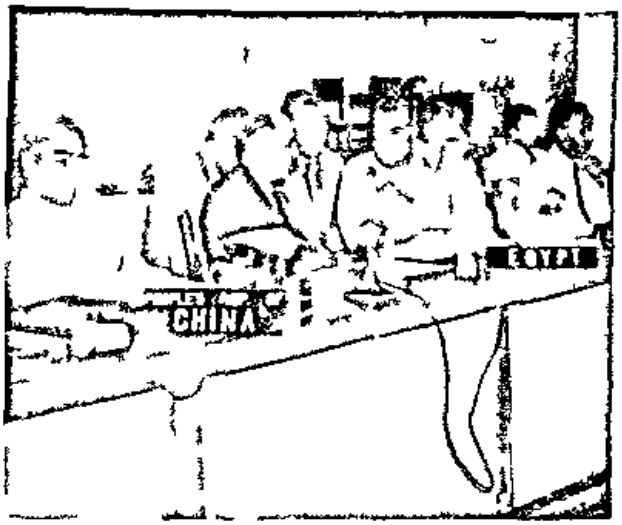
IV MUTUAL SECURITY AGENCY CONTROLS FOREIGN AID T 200b

V TRUMAN'S SECOND TERM T 200 U-394

- A Foreign policy T 200-200a North Atlantic Treaty Organization U-394 chart U 394a map U 394b United States fights Communism in Korea U-394-394a K-65-7
- B Strengthening the national defense and ending World War II U 394a 395

VI EISENHOWER'S ADMINISTRATION E-28 *d f*

- A. Korean truce signed K-66 picture L 335
- B New Cabinet post established—the Department of Health Education and Welfare U-367
- C The cold war with Russia continues E-287*d f* larger defense appropriations U 395
- D Air Force Academy established E-287*e*
- E *Democrats win mid term elections* E-287*e*



CONFERENCE AT BANDUNG INDONESIA
For the first time in history Asian and African leaders met in 1955 Premiers of 29 nations discussed economic co-operation.

- F Congressional resolution assures president of United States power to defend Formosa *E-287f*

LATIN AMERICA IN TRANSITION

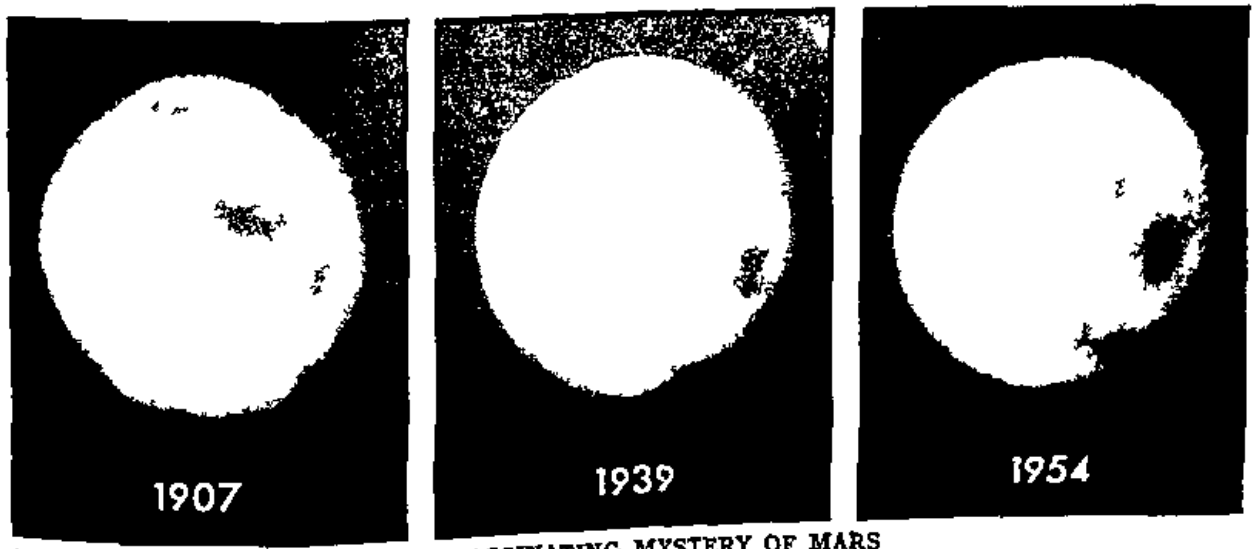
I LATIN AMERICA COMMANDS WORLD ATTENTION L-106-7 See also the Reference-Outlines for South America and Mexico and the articles for the Central American republics

- A Its rapidly growing significance in world affairs L-106-7 118 S-266
- B Its contributions to world needs S-266-7 coffee from Brazil B-293 wheat and meat from Argentina A 334-5 nitrates from Chile *C-251 oil from* Venezuela Peru Mexico V-442 P 162 M 201
- C Importance of Latin American trade with the United States S-268 C-175 L-118
- D Attraction of undeveloped resources S-248, B-291 L-106
- E Strategic position of Latin America in current world conflicts maps S-249 A-531

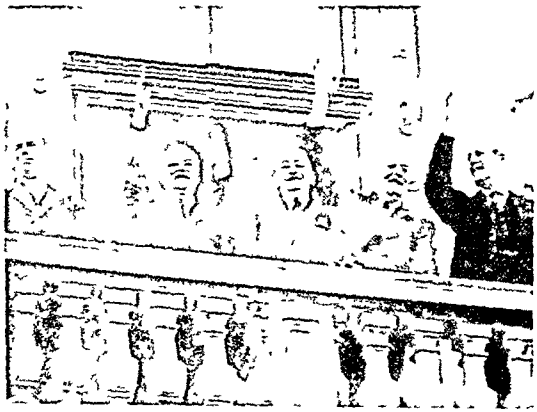
II GENERAL CONDITIONS varied cultural factors and racial makeup L-107 109-12 S-250 new spirit of progress L-106 119 Latin American outlook on life L-108 9 See also the Reference-Outlines for South America and Mexico

III OBSTACLES TO PROGRESS

- A *Many regions* isolated by mountains or impenetrable forests S-248 L-109 118 C-250 A 184
- B Extremes of climate hamper human activity S-250 L-109 C-251 pictures S-277
- C Inadequate transportation and communication S-264-5 A 186 L-118



ANOTHER CHAPTER IN THE EVER FASCINATING MYSTERY OF MARS
Is there life or even vegetation on the planet Mars? See the differences in these photographs published in 1955 The dark area near the center in the 1907 photograph is larger in 1939 and *still larger in the* 1954 photograph. In 1907 astronomers thought it a canal. Now it is so large—300 000 square miles—they think it a new region possibly with plants



CO-OPERATION AT VIENNA

Austria became a free nation again May 15, 1955. The treaty was signed by, from left, Pinay (France), Molotov (Russia), Figle (Austria), Dulles (United States), Macmillan (Britain).

D. Low living standards among masses L-118. few wealthy families usually own best land S-264, C-174, B-290, A-331, C-253, L-112, primitive Indian culture still dominates many sections S-261-3, C-173, B-291, M-192
E. Industrial development delayed by lack of purchasing power S-268, P-161
F. Prosperity depends on a few large exports S-266-8
G. Natural resources often under foreign control L-118-19: petroleum in Mexico and Venezuela M-201, V-144; nitrates in Chile C-251
H. *Political confusion* in many republics: lack of preparation for democracy L-112-13, C-177; dictators frequently seize power S-278, L-114

IV. MOVEMENTS TO SOLVE THESE PROBLEMS
A. Spread of education L-116-18, C-174: Argentina A-336; Chile C-256; Mexico M-203-4
B. New literature stresses social problems L-125
C. Improving conditions of labor L-119
D. Efforts to increase production L-119
E. Growth of manufacturing S-268, C-253, B-294
F. Steps to control foreign capital L-119-20
G. Breaking up great landed estates L-119
H. Surmounting transportation handicaps L-118
1. South America S-264-6, B-224, A-336, C-254, B-293, P-164, picture L-108
2. Central America C-176, G-222*c*, N-233, S-33
3 Mexico M-202, R-158*f*

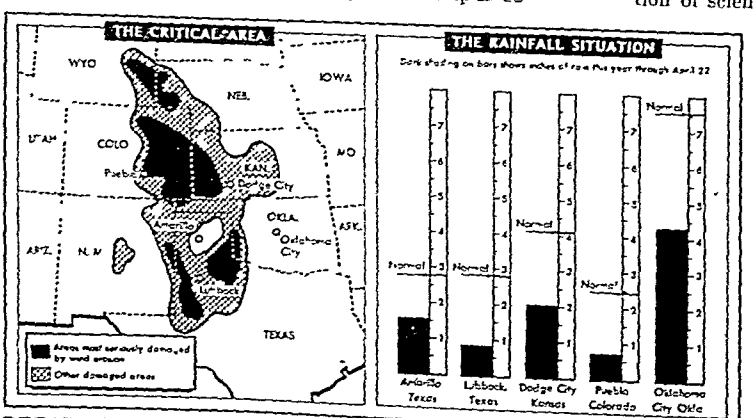
V. FOREIGN RELATIONS OF LATIN AMERICA
A. Influence of Old World powers L-106-7
B. Early distrust of "Yankee imperialism" L-120: first Pan American Conferences L-120
C. Effect of "good neighbor" policy of the United States L-120-1
D. Recent Pan American conferences—Monroe Doctrine gains united support L-121-2
E. Export-Import Bank helps stabilize Latin American finances and trade L-122
F. The Pan American Union L-123
G. Mexico expropriates oil holdings of Britain and the United States M-201-2

VI. WORLD WAR II AND AFTER
A. Declaration of Panama sets up "zone of security" L-121
B. Act of Havana prevents aggressor nations from gaining foothold in New World L-121-2
C. Latin America in the war W-259-60
D. Latin American nations help to form the United Nations L-122
E. Organization of American States L-122-3

SOCIAL AND ECONOMIC PROBLEMS AND MOVEMENTS

I. DEMOCRACY IN A CRITICAL PERIOD
A. Requirements for and obstacles to effective self-government D-66-7: examples of failure—Italy I-274; Germany G-98; Spain S-322*a*
B. Spread of antidemocratic theories: Fascism F-43-4; Communism C-425-7; dictatorship D-88

II. PROBLEMS OF A MACHINE AGE U-386-8
A. Effects of Industrial Revolution continue I-134
B. Economic and social consequences of mass production I-140, M-13-14, E-226-7: higher scale of living I-138: increase of leisure L-158-9; stimulation of scientific research I-145-6, I-203-4; con-

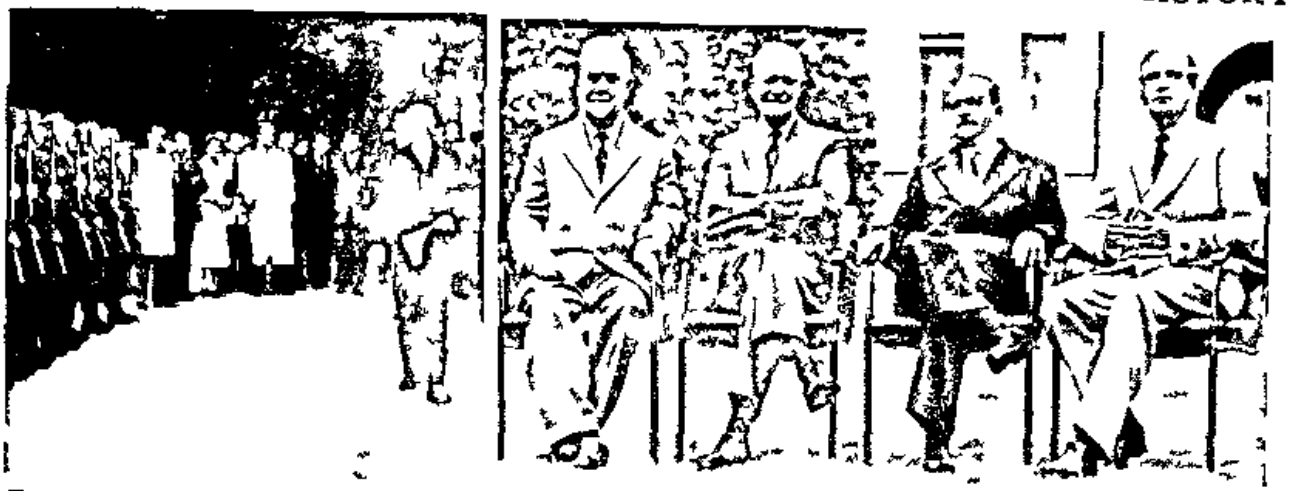




DREAD PHENOMENA OF NATURE HERE AND IN HAWAII

Since 1951 drought has turned parts of seven states into a Dust Bowl. Many "disaster area" counties received federal relief. In 1955 agricultural leaders sought a plan to combat drought.

After some 50 years of quiet the Kilauea volcano system in Hawaii erupted in March 1955. Streams of fiery lava ruined villages. Kilauea is the legendary home of Pele, goddess of fire.



HISTORY PRESENTS A NEW NATION AND A MEETING AT THE SUMMIT

Kon ad Adenauer left was the chancellor who got sovere gnty for Wes ern Germany in 1955 At r ght are the fou heads of state who met in 1955 at Geneva to try easing wo ld tens on From eft Russ a s Prem er Bulgan n Pres dent E senhower and P em e s Faure of France and Eden of Br tain. Eisenhower proposed that Russia and the U S exchange air surveys of defenses

centrat on of populat on in s and probl ms of city l fe C-323-323b technolog cal unemploy ment M 13 I 145

C Trend toward decentral zat on I 144

III CHANGES IN THE STATUS OF LABOR L-69-75

A R ght to collect ve ba ga n ng L-72

B Standard z ng hou s and wages L- o

C Increase of a b trat on n labor d sputes A 295

D Confl ct between trade un ons (A F of L) and indust al un ons (C I O) L-71 ?

E Trends n labor movement abroad L-75

IV PROBLEMS OF THE FARMER A 66

A H gher fa m product on lowe costs A 59-61

B Farmer s need for collect ve barga n ng A 66 co-operat ve sor et es C-4 0

C Dep essed cond t ons in ag cultu e A-68

D The quest on of farm c ed t F 20

E Efforts to stab l ze ncome A 68 U 366

F Tenant farme s and sharec oppers C-495

G Ra s ng standa ds of ru al l fe A-65 A 501 4-H Clubs F 252-252b

H Help ng the farmer plan for the future U 364

V THE CONSUMER AND H S INTERESTS problem of consume o-ope at ves C-4 0-2 a guments for and aga nst chain sto s C 181 ? good and bad po nts of advertis ng A 23-4 nstallment sell g and buy ing I 165 T 125-6 fight aga nst fraud A 25 Fede al Trade Commis on F-50 Pure Food Laws P-442

VI GROWING DEMAND FOR SECURITY

A Problem of unemployment R-209 S-218

B Support of those too old to work P 140-1 S-218

C Insu ng health and comfort H 308-10 group health nsu anre S-218a problem of adequate she ter B-34 H-43?a 433 p ctures H-432

D Safety and acc dent p event on S-3 12 E-341

E Rel ef of the dest tute P 368-9

VII CONSERVATION MOVEMENT C-451 see also the Reference-Outl ne for Conservation

VIII MODERN EDUCAT ON E-?38-63 See also the Ref eren e-Outl nes fo Personal ty and Character De- v lopment and Vo at ons

A Tra n ng n use of le sure t me L-158-61 choos-





GREAT POWER RESTS IN THE HANDS OF THESE MEN

Sir Winston Churchill left vis ts Sir Anthony Eden As prime mmis er of Great B tain and head of the Conservative par y Eden won an easy v ctory in the 1955 general election. *George* Meany lef pres dent of the A F of L. and Walter Reuther p es dent of the C I O agree to merge their great labor unions. The his oric decis on was made in February 1955



ATOM BLAST AT "DOOMTOWN" ON YUCCA FLATS, NEVADA

Television showed this picture of observers watching the Civil Defense test May 5, 1955. They were eight miles from the blast.

Two brick houses, 4,700 feet from the blast, were ruined. Tumbling bricks smashed this car. Others were unhurt.

ing a hobby H-387-401; planning vacation activities V-421-32

B. Modern approach to home economics and management H-409-13

C. Growing interest in detailed social backgrounds of American democracy: colonial life A-192-217; pioneer life P-260-71, Far West F-37-43; Oregon Trail O-420-2; American Southwest S-307-308b; cattle ranching C-147-55 See also the Reference-Outline for United States History

D. Analysis of propaganda and its influence on society C-424*g-h*, R-50-1

ADVANCES IN SCIENCE AND TECHNOLOGY

I. PHYSICAL SCIENCE

A. Matter and energy M-142*a*, E-344: atom smashing A-460, P-235, X rays reveal atomic patterns X-330, the atomic bomb W-296, A-467; the hydrogen bomb A-467-9

B. Radiation R-29: artificial radioactivity R-54-54*a*, 55, infrared rays I-149

C. Electronics E-316

D. Photoelectric effects P-209

E. Modern chemical research C-222, O-424

F. Einstein's theories R-98-101

G. Astronomy A-442· planet Pluto discovered P-285; galaxies (island universes) N-106, picture S-370; exploding stars S-373

II. METEOROLOGY: weather forecasting W-82; recent studies of climate C-351

III. HEALTH AND NUTRITION H-300

A. Vitamin discoveries V-494-8, H-402

B. Allergy and food poisoning H-303-4

C. Gland therapy and hormones G-118, H-424-6 (isolation of insulin H-426, D-105, B-53)

D. Sulfa drugs, penicillin, and other germ fighters A-266-8

E. RH factor in blood B-210

F. Influenza vaccine H-308

G. Salk polio vaccine V-433, 433*b-d*, pictures V-433, 433*b*, *c*, *d*

IV. TRANSPORTATION AND COMMUNICATION ADVANCES T-170-170*b*, C-424*c-d*. See also Reference-Outline for Transportation and for Communication

V. INDUSTRIAL ARTS W-296. See also the Reference-Outline for Industry, American

VI. OTHER TECHNIQUES

A. Progress in photography P-227: telephotography T-45; phototypesetting, pictures C-424*e*

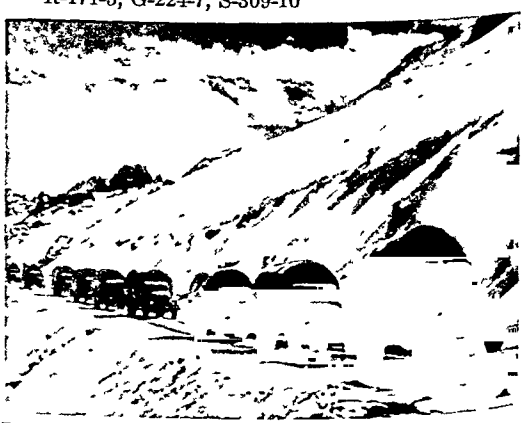
B. Motion-picture techniques: sound pictures M-421-2; technicolor M-418; animated cartoons M-426-9; three-dimensional effects M-434

C. Research instruments: ultracentrifuge C-178; electron microscope M-236

D. Photoengraving and photolithography P-210*a-d*

E. Calculating and dictating machines C-18*a*, D-87

VII. THE NEW FRONTIER: rockets and guided missiles pave the way for man's exploration of outer space R-171-3, G-224-7, S-309-10



RED CHINA BUILDS TIBET ROAD

This 1,400-mile truck road opens Tibet to trade. Climbing peaks 16,000 feet high, the road links Lhasa, in Tibet, to Yaan, China.

ADOLF HITLER—*Apostle of* DESTRUCTION

HITLER, ADOLF (1889–1945) The rise of Adolf Hitler to the position of dictator of Germany is the story of a frenzied ambition that plunged the world into the worst war in history

An abnormal atmosphere shrouded Hitler's entire life He was born April 20, 1889 at Braunau-am Inn Austria, of German descent His father Alois was the illegitimate son of Maria Anna Schicklgruber In middle age Alois took the name Hitler from his paternal grandfather After two wives had died Alois married his foster daughter, Klara Poelzl a Bavarian 23 years younger than he She became Adolf's mother



ADOLF HITLER

Hitler's rambling emotional autobiography 'Mein Kampf' (My Struggle) reveals his unstable early life His father, a petty customs official wanted the boy to study for a government position But as young Hitler wrote later *the thought of slaving in an office made me ill* not to be master of my own time' Passively defying his father the self willed boy filled most of his school hours with daydreams of becoming a painter His one school interest was history, especially that of the Germans When his teacher glorified Germany's rôle, we would sit there enraptured and often on the verge of tears" From boyhood he was devoted to Wagner's operas that glorified the Teutons dark and furious mythology As a schoolboy he seemed to make no friends Later he boasted in Mein Kampf that he had been argumentative and quarrelsome

Failure dogged him After his father's death when Adolf was 13, he studied water color painting, but accomplished little At his mother's death, when he was 19, he went to Vienna There the Academy of Arts rejected him as untalented Lacking business training, Hitler eked out a living as a laborer in the building trades and by painting cheap post cards He often slept on park benches and ate at a charitable soup kitchen

Hatred Nourishes Seeds of Nazi Doctrines

These humbling experiences inflamed his discontent He hated Austria as "a patchwork nation," and looked longingly across the border at energetic, powerful Germany. He wrote, "I was convinced that the State [Austria] was sure *to obstruct every really great* German and to support . everything un German. I hated the motley collection [in Austria] of Czechs, Ruthenians, Poles, Hungarians, Serbs, Croats, and above all that ever present fungoid growth—Jews . I became a fanatical anti Semite"

Hitler's hatred of poverty, his rabid devotion to his German heritage, and his loathing of Jews combined to form the seeds of his later political doctrine He studied the political skill of Vienna's mayor and took *special note of* that leader's practise of "using all instruments of existing power, and of gaining the favor of influential institutions so he could draw the greatest possible advantages for his own movement *from such* old-established sources of power" *Hitler later applied* this technique in Germany

In 1912 *Hitler left* wretched Vienna for Munich, a *true German town*' There he drifted from job to job as carpenter architect's draftsman, and watercolorist Always he ranted about his political ideas

At the outbreak of the first World War in 1914, he *gave up his* Austrian citizenship to enlist in the 16th Bavarian infantry regiment He would not fight for Austria, but I was ready to die at any time for my *people* [Germans]' In his first battle *the Ypres offensive of 1914* he shouted the song Deutschland uber Alles On the Somme in 1916 he was a 'front fighter' against *British tanks* rose to lance corporal, won the Iron Cross as dispatch runner and was wounded In 1917 he fought in the third battle of Ypres. He was gassed in October 1918.

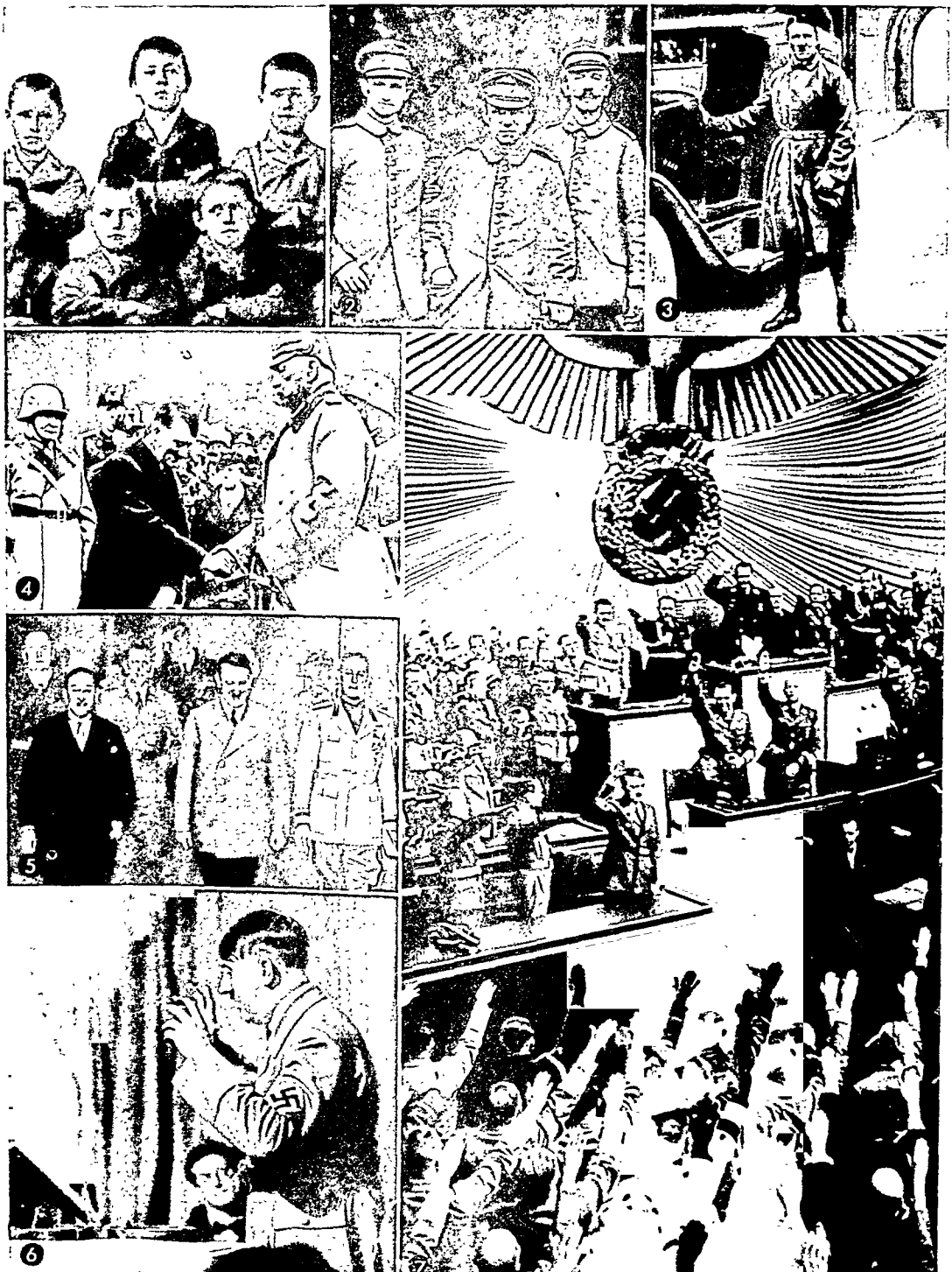
The armistice found him in a hospital in Pomerania temporarily blinded by mustard gas and suffering from shock *The news of Germany's* defeat agonized him 'While everything began to go black again before my eyes I buried my burning head in the covers and pillows He believed that defeat had been caused by enemies within,' chiefly Jews and Communists, who had stabbed Germany in the back"

War Makes Hitler a 'Man Without a Country'

Now no longer an Austrian citizen and not yet a German citizen, Hitler at the war's end was a man without a country Bewildered he remained in the army stationed in Munich In the political and economic tempest that swept defeated Germany, Munich became a storm center Officers of the beaten *Reichswehr* (German army) conspired to win control of Germany They maintained 'informers,' one of whom was Adolf Hitler He was assigned to report on "subversive activities' in Munich's political parties

This political spying was the turning point of Hitler's life One night in 1919 he threaded his way through the Herrenstrasse to a bleak little restaurant where a handful of young people sat around a half broken gas lamp This little band was the German Workers' party Guided by 'intuition,' Hitler joined as its seventh member He soon took the lead Then a Reichswehr officer, Capt Ernest Roehm, saw the party as a possible means of overthrowing the liberal Bavarian republic Like other officers, Roehm had built one of the private "volunteer" armies, which grew up as arms of the Reichswehr in defiance of the Versailles treaty Roehm assigned his arrogant,

FROM AUSTRIAN SCHOOLBOY TO RULER OF GERMANY



1. Hitler (middle of top row) with fourth grade schoolmates in Austria. 2. With two comrades during the first World War, when he wore a heavy mustache. 3. In 1924, photographed by his friends as he comes out of prison. 4. Hindenburg makes him German chancellor in 1933; Goering stands behind him. 5. With Italian and Japanese delegates at anti-Comintern meeting. 6. Addressing a Nazi party congress. 7. Telling the Reichstag that war has begun in Poland, 1939.

iron hard Brown Shirt army to aid the Workers' party Bulwarked by these armed ruffians, Hitler became the orator of the group

Creates the Nazi Party

In 1920 he changed its name to *Nationalsozialistische Deutsche Arbeiterpartei* (National Socialist German Workers' party), abbreviated to *Nazi* Sneering at the liberal generalities of the various *bourgeois* parties and hating the Communists Hitler shouted accusations against the Jews and cried out to the Germans to form an all powerful national state His voice, torn and hoarsened by mustard gas hypnotized his listeners as he cried, We will incite the people, and not only incite we will lash them to a fury We will preach struggle" His flaming speeches kindled the anger of rivals, especially the Communists, and they tried to break up his meetings In those rallies "only the brutal recklessness of our guards thwarted enemy attacks"

The flamboyant spirit of the growing Nazi party now began to attract the varied restless men who were to become its core They included chiefly Alfred Rosenberg, Russian-born engineer and philosopher anti-Jew, and anti Christian Rudolph Hess, Egyptian-born mathematician and geographer, Hermann Goering, Bavarian combat pilot, Gen Erich von Ludendorf, war hero, and Maj Gen Franz von Epp, Bavarian infantry commander All helped to persuade Communist fearing German industrialists to give money to the party, for Hitler assured them that 'we combat only Jewish international capital' An established Munich journal, *Volkischer Beobachter* (National Observer) was bought to spread Nazi influence For his mounting ranks of followers Hitler adopted the ancient swastika (hooked cross) as the party emblem and designed the Nazi's red banner with the black swastika He saluted his comrades with raised stiff arm and was greeted by the word *Heil!*

From "Beer Hall Putsch' to Prison

By 1923 the Nazis had grown strong enough in Munich to try to seize the government They started the 'Beer Hall Putsch" so-called because the Nazi headquarters were in a beer hall Though aided by General von Luden lorf, it failed Hitler was convicted of treason and sentenced to five years in a prison fortress at Landsberg-am-Lech, but the liberal Bavarian government commuted the term to eight months While in prison Hitler, aided by the loyal Rudolph Hess, began 'Mein Kampf

Emerging from prison in 1924, Hitler once again seemed destined to failure The government had banned the Nazi party, and only a handful of the members clung together For months Hitler took little interest At length Roehm, Hess and a newcomer—a small, lame enthusiast named Paul Joseph *Goebbels*—spurred him back to leadership Accepting Hitler said, "I shall need seven years before the movement is on top again"

Industrialists Help to Rebuild Nazi Party

He was right The years 1924–28 were prosperous for Germany, and revolutions do not flourish on prosperity From 1925 to 1927 Hitler was even *forbidden to* speak publicly in either Bavaria or Saxony But when world wide depression plunged Germany *again into* poverty and unemployment the Nazis began to gain votes By 1930 Hitler had gained the support of many industrialists like Dr Gustav Krupp, head of the Krupp steel works The military caste also supported him Finally in 1933 the scheming Nazis succeeded in raising their Fuhrer to the chancellorship In the article on Germany you may trace the steps by which Hitler became dictator scourge of Europe and instigator of the second World War (*See also* World War Second)

Believing himself on the road to world conquest in 1941 Hitler made himself Personal Commander of the Army and in 1942 Supreme War Lord But on July 20 1944 a group of officers dismayed by his 'intuitive military failures, set off a bomb in his office He escaped with only a nervous shock

The Legend of "Hitler the Superman

Nazi propaganda had made of Hitler a symbol of strength and national virtue He had won German citizenship in 1930 only by the scheming of Nazi henchmen, yet he was hailed as the ideal German leader His indecisions were cloaked as "intuition" Despite his hours and even days of brooding inertia he was pictured as a man of intense action He became idolized by young Germans, whom he had betrayed by his creed, the entire work of education is branding the race feeling into the hearts and brains of youth' Covering Hitler's unsavory and cruel character propaganda built a legend of his ascetic habits and selfless devotion to Germany Some of this legend vanished when his long, secret association with Eva Braun was revealed He married her in April 1945, just before he committed suicide in the ruined Reichschancellory

HITTITES (*hit' its*) Four thousand years ago the warrior Hittites of Asia Minor rose to world power For more than a thousand years they ruled most of the region included in modern Turkey and Syria Their empire rivaled in size and strength the two other world powers of the time, Egypt and the Assyro-Babylonian empires of Mesopotamia

About a thousand years before our era their empire fell and their civilization passed into oblivion Only their name remained, kept in man's memory by scattered references in the Old Testament

The story of the Hittites, nearly all that we know of it *has been recovered* within a single lifetime Most of it has been pieced together *since the first World* War Our chief source of information is the royal *library of* 10,000 clay tablets discovered in 1906 and

HITTITE WARRIOR



The Hittite had a hooked nose and a sloping forehead, like the modern Armenian. The carving is from a gate of the old Hittite capital.

later, in the ruins of the ancient Hittite capital Khattushash, near Bogaz Koi in Turkey, about 90 miles east of Ankara.

These tablets are in cuneiform writing, and most of them, though in Babylonian spelling, are in the Hittite language. For years Hugo Winckler, the German archeologist who made the find, and other scholars labored vainly to get a clue to this unknown tongue. One day an Austrian professor, Friedrich Hrozny, found, in the same sentence with the Babylonian word-sign for bread, the Hittite word "wadar" spelled out He thought this might be the same as our "water." Other words seemed to have the same roots as the Latin *aqua* (water), and our word "eat" Working from these slight clues, by 1915 he was able to announce that he had solved the riddle, and that Hittite is an Indo-European language, related to our own. But the translation of the tablets took another ten years.

MASTERPIECE OF HITTITE SCULPTURE



These superb lions, carved into the base of a pillar, were dug up near Antioch In ancient times lions were plentiful in Syria.

PERFUME JAR



The Hittites were skilful potters. Notice how the lid is fastened to the handle.

From these and other documents, and from the remains of their great fortified cities, we now know that the Hittites were wild tribesmen when, not long after 3000 B.C., they swept down from the north with horse and chariot and good bronze daggers. They found it easy to conquer the farmers and herdsmen of Asia Minor, who were skilled only in the arts of peace and had no means of transport faster or more powerful than the donkey. It was almost 2000 B.C., however, before the Hittite dominions were united into an empire by a king named Labarna. A later king pushed the Hittite power into Syria and Mesopotamia. This empire lasted until 1650 B.C. A still more powerful one arose in 1450.

If the basis of the old empire had been the horse, that of the new was iron. The Hittites appear to have been the first to use iron. For a time their mines on the Black Sea represented the world supply.

Later the Hittite domain broke up into city kingdoms (1050–850 B.C.), and these finally collapsed before the Acheans, who came in a new wave of Indo-European invasion like that from which the Hittite empire had sprung. The Hittites continued to be famous soldiers, however. Uriah the Hittite was a captain in David's army.

In the fertile fringes of their rugged country the ancient Hittites planted barley, wheat, grapes, and olives Beekeeping was their sugar industry. They raised horses, cattle, sheep, and goats. Their shoes, turned up like a ski, were invented for use in snowy mountain passes. Loom weights and spindle whorls found in great numbers show that they manufactured cloth. Beautiful cups, jars, and pitchers indicate their interest in graceful and original forms and in convenient contrivances. The Hittites were also famous workers in metals. Their business methods were Babylonian, and for buying and selling they too used the weighed pieces of silver from which the Greeks got the idea for coins. Caravan routes led from town to town. Big game abounded, and hunting was the sport of king and commoner.

SECRET NOTE



The Hittites sealed their clay documents in clay envelopes This one was a slave contract.

The Hittite state was a military organization. Daily life was closely regulated by law. The price of plowed field and vineyard, of cattle and their hides, was fixed. So were the wages of free man and slave. Punishments were mild, but crimes such as murder and theft were made prohibitively expensive by heavy fines.

The Hittite contributed to Western civilization by acting as middleman for the older cultures of the East. He passed on to the Greeks ideas which influenced their art, their religion, and their business. His mines supplied the iron which put new implements in the hands of the Mediterranean peoples and brought the Bronze Age to a close. Above all, he contributed by holding with a firm hand the bridge between Asia and Europe while Western culture was in its early stages. Asiatic despots might have throttled European civilization in its infancy, had it not been for that thousand years of Hittite supremacy in Asia Minor.

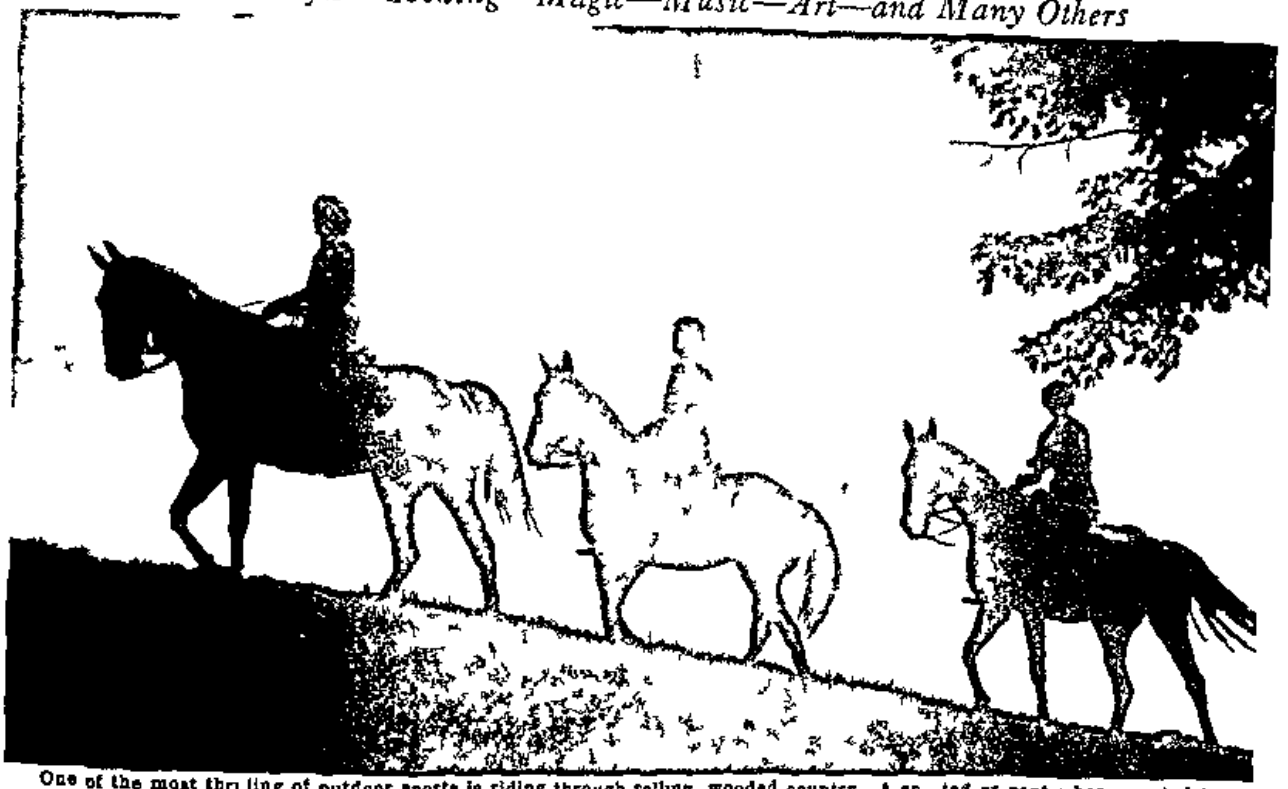
EAGLE SEAL



This two-headed eagle was a Hittite religious symbol. The famous Austrian eagle is said to have been derived from this symbol seen on Syrian temples during the Crusades.

The CHOICE *of a* HOBBY

Ship Models—Sailing—Aviation—Stamps—Guns—Fishing—Riding—Wild Life
Camping—Pets—Photography—Amateur Science—Radio and Television
Handicrafts—Cooking—Magic—Music—Art—and Many Others



One of the most thri ling of outdoor sports is riding through rolling wooded country A sp ted or gent e horse suited to your equest ian ab lity will g ve hours of keen enjoyment and exe cise n the f esh a r

HOBBIES Wherever you live and whatever your age be sure to choose your own hobby Choosing is creat ng is not merely an old Persian proverb It is a gu de for the use of a list des gned as a spring board for personal adventure

Since The Choice of a Hobby was first published in Compton s Pictured Encyclopedia in 1934 hobby r ding has become an increasingly popular sport Hobby shows have become regular events and hundreds of new books relating to hobbies have been published A liberal select on of the most interesting and up-to-date books is included under the 50 different subjects in this list Boys and girls have shared their experiences Specialists in the var ous subjects have contr buted ideas and book titles which have been carefully considered I have a hobby of making th ngs in wood confided an eleven year-old boy in a New York library I ve made two sail boats from the plans in this book and sa led them on the lake in Central Park I ve made a marionette stage too My father has given me a room in an old office building he owns and I keep all my lumber there and go down to work every Saturday I just love to work down there '

When I *want to make anything* I take it out of my mind was the reply given by a ten year-old boy in Maine when asked *if he had* a book to show how to bu ld the things he wanted to make For this boy one end of the long l ving room of an old Maine farm house had been part t oned off to make a shop For a long time he built airplanes then he became interested in music Wh le serving in the navy during the second World War he was assigned to a radar group He is now engaged in scientific exploration

Hobby riding is not a modern sport and of this there are many reminders George Washington kept a diary telling of the hobbies he delighted to ride And until we learned what Washington liked to do in his spare time how much he cared about horses and riding hunt ng and fishing most of us were never very interested in reading about his life Having a strong spontaneous interest in a subject of perennial living interest as Benjamin Franklin had in electricity as Theodore Roosevelt had in animals as Frankl n Roosevelt had in ships and sailing and in stamp collecting g ves a man his own place in the memory of any boy or girl holding similar interests

It is impossible in lim ted space to list under indi vidual title the many excellent bulletins and pamphlets relating to animals birds insects wild flowers agriculture and other subjects which are issued by state and Federal governments So it is suggested that readers who desire more material on any subject consult the l brarians of publ c or school libraries concerning available material in pamphlet form

The Merit Badge pamphlets issued by the Boy Scouts of America, the handbook published by Camp Fire Girls, the guides issued by the National Athletic Collegiate Association and published in the American Sports Library (Barnes), and the 'Manual of Ship Model Making' issued by *Popular Science Monthly* are among those mentioned by librarians who make constant use of them. Basic Science Books in paper covers well illustrated in color are sold at the American Museum of Natural History in New York and at the Chicago Natural History Museum.

Ships and Sailing

The Cruising Manual. By Gerry Mefferd. (McGraw, 1941.) Based on the experience of the author, a Des Moines boy, and his partner who made a round-the-world cruise in a ketch they built themselves. Written with humor and an understanding most helpful to those contemplating a first season of cruising.

Sailing to Win. By Robert N. Bavier. Illustrated (Dodd, 1947.) Specific information enhanced by many photographs and illustrations on racing rules, starting tactics, etc.

Ships of the U. S. Merchant Marine. By S. Kip Farrington. Illustrated by Jack Coggins. Introduction by Adm. Chester W. Nimitz. (Dutton, 1947.) Informative, non-technical text. Many illustrations in full color.

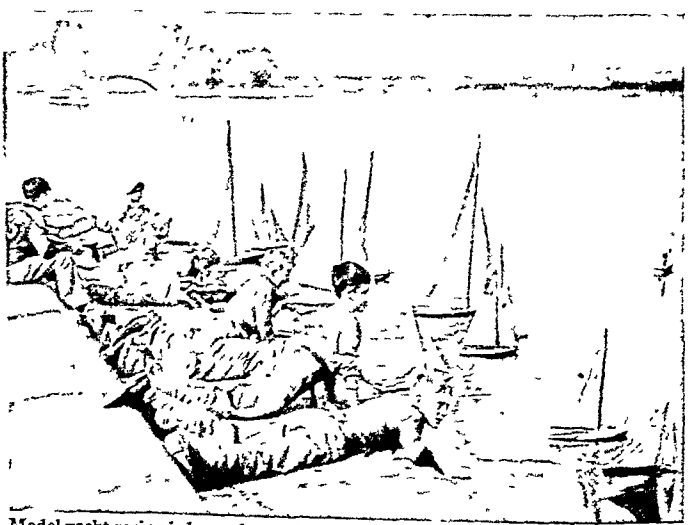
The Amateur Seaman. By H. S. "Skipper" Smith Revised edition (Dodd, 1948.) First published in 1936, it is recognized as a bible for the amateur seaman. Covers everything from choosing a boat to coastal navigation.

The Sailing Ship. By Romola and R. C. Anderson. (Dodd, 1947.) From Egypt to the last days of the sailing ship. Profusely illustrated with drawings in the text and full-page plates. An attractive book.

Handbook of Outboard Motorboating. By Porter Henry and Bill Allard Illustrated. (McGraw, 1948.) A comprehensive up-to-date guide to the selection and maintenance of all types of outboard motors. For the novice or the experienced boatman. Gives latest federal and state regulations.

How to Design Small Sailboats. By E. C. Siebert. (Dodd, 1947.) A well-illustrated book dealing with the drafting of working plans for a small sailboat.

Piloting, Seamanship and Small Boat Handling. By Charles F. Chapman. (Motor Boating, 1952.) This classic text for beginners appears in a new edition. Used in the Power Squadron's elementary classes all over the country.



Model yacht racing is becoming an increasingly popular hobby for all ages. Here a group of boys are launching their boats in the final heat of a race.

Encyclopedia of Knots and Fancy Rope Work. By Raoul Graumont and John Hensel. 3d edition. (Cornell Maritime Press, 1943.) A fascinating large-size book profusely illustrated with every kind of knot and many designs of ornamental rope work. An historical record.

Learning to Sail. By H. A. Calahan. (Macmillan, 1947.) A revised edition of a practical handbook for those who sail small boats. Deals with selection and care of sails and hull, rules of road, piloting, handling the boat, etc.

Oars, Sails and Steam. By Edwin Tunis. (World Pub, 1952). A pictorial history of ships presented in pen and ink drawings of exceptional beauty and authenticity. Reliable descriptive text by the artist-author.

The Boatman's Manual. By Carl D. Lane. Revised edition. (Norton, 1951.) A compact and complete manual on small boats—rowboats, canoes, sailboats, motorboats and their operation both coastwise and inland. Many clear drawings and good index.

The A B C of Yacht Design. By Charles G. Davis. (Rudder, 1935.) A simple treatise for beginners covering all the principles of yacht design.

Small Boat Building. By Edwin Monk. (Scribner, 1934) For the amateur, with 16 modern small boat designs. Row boats, sailboats, outboards, hydroplanes, and a runabout. Construction and detail fully considered in the text and diagrams by a naval architect.

The Ship's Husband. By H. A. Calahan. (Macmillan, 1937) An informative guide to yachtsmen on the care of their craft.

Sailing Made Easy. By Rufus G. Smith. Photographs by Walter Civardi. (Dodd, 1947.) An all-picture book on sailing with clear reliable captions leading step by step from the first day in a sailboat.

The A B C of Boat Sailing. By Herbert L. Stone. New edition (Dodd, 1946) An excellent book for the beginner, containing many maneuvers illustrated with diagrams.

Ship Model Building

Boatbuilding in Your Own Backyard. By S. S. Rabl. Illustrated (Cornell Maritime Press, 1947.) Written and fully illustrated by a naval architect and builder for the amateur.

How to Build Small Boats. By Edson I. Schock. Illustrated. (Barnes, 1952.) Complete plans for building 12 different types of boats—rowboats, outboards, sailboats, and others.

American Ship Models and How to Build Them. By V. R. Grimwood. (Norton, 1943.) The best book in this field. Contains accurate plans and drawings for constructing authentic scale models and numerous sailing vessels from the simple model to the square-rigger. Reading list and glossary.

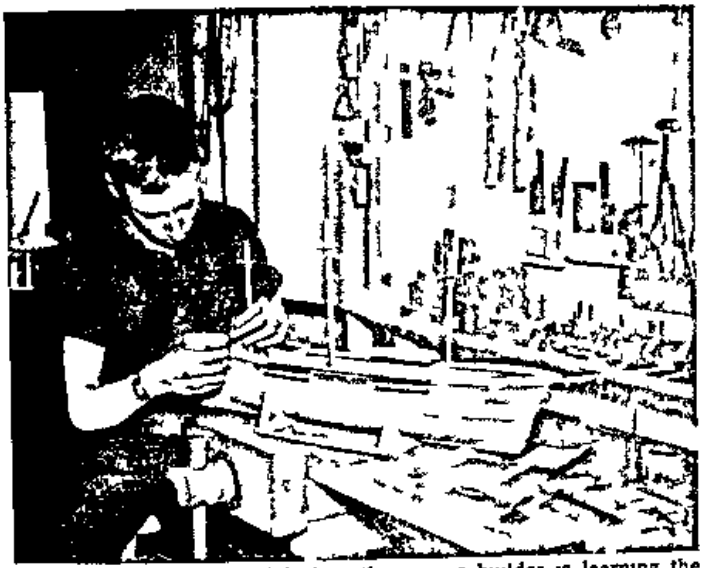
United States Navy Waterline Models and How to Build Them. By John P Cranwell and Samuel A. Smiley. (Norton, 1947.) Scale models of 20 United States naval vessels ranging from the *Mighty Mo* of the Pacific fleet to the little destroyer *Buckley*. The first book of its kind. Detailed descriptions are fully illustrated.

Aviation

Safe for Solo, What Every Young Aviator Should Know. By Frederick M. Reeder. Illustrations by Robert C. Osborn. (Harper, 1947.) A readable, reliable, and amusing book. The author was in charge of the United States Navy's Flight Instruction School. The illustrator is known for his Dilbert cartoons. His illustrations form an integral part of the text.

Rockets, Missiles and Space Travel. By Willy Ley. (Viking, 1951.) The future of flight beyond the stratosphere.

Rockets and Jets. By Herbert S. Zim. Illustrated. (Harcourt, 1945.) Contains chapters on rockets in battle,



Intent on rigging his model ship this young builder is learning the thrill of craftsmanship and the lore of great sailing ships

rocket motors the goals of interplanetary rockets jets and near jets etc

The Boys Book of Rockets By Raymond F Yates Illustrated (Harper 1947) Facts and pr n iples of rocket com bustion and propulsion clearly explained Includes a chapter on the men behind the rockets

The How of the Helicopter By Alfred H Stevens Illustrated by Ernest Stock (Cornell Maritime Press 1946) Author and artist are experienced fliers

Stick and Rudder By Wolfgang Langewiesche-Brandt Illustrated (Whittlesey 1944) An explanation of the art of flying Special append x on the dangers of the air an analysis of the airplane s controls

Airplane Model Building By Gene Johnson (Cornell Mar time Press 1946) Clear reliable instructions for the beginner Includes tools and mater als needed to construct gliders and stick models sol d scale models flying models helicopters etc Effectively illustrated

Horizons Unlimited By S Paul Johnston (Duell 1941) A graphic h story of aviation present ng many types of balloons and a rships ornithopters helicopters autogiros gyroplanes gliders and sail planes A dramatic presentation

Parachutes By Herbert S Z m (Harcourt 1942) Their value in explorat on fire fighting airmail de livery and meteorology—as well as in war

Flying Power Written and illustrated by C J Hylander (Macm llan 1943) A book about a rcraft engines and how they work by an instructor of cadets

Model Aircraft Handbook By William Win ter Illustrated by Paul Plecan and H A Thom as (Crowell 1943) Covers point by po nt des gn construct on and flying techn que in authoritative terms

Model Planes for Beginners By H H G l more Revised edition (Harper 1947) Sim pl fied models of real planes A very popular small book illustrated with many diagrams and draw ngs by the author

The Aircraft Yearbook Published annually by Lincoln Press The official record and reference work on American aviation Contains aviat on chronology and records

Stamp Collecting

America s Stamps By Maud and Miska Peter sham (Macm llan 1947) The story of one hun dred years of U S postage stamps dramatically illustrated in color by the authors Picture-book size and attractive to boys and g rls Philatelic Foundation finds it accurate

The United States Commemorative Stamps of the Twentieth Century By Max G Johl Illustrated Vol I 1901 1935 Vol II 1935-1947 (Lindquist 1947) Drawings made by Cecil Seymour A thorough and comprehensive coverage of data pertaining to the commemoratives of the United States The story of the Armed Forces series is given in full A unique work by a United States first-rank philatelist

Scott s Standard Postage Stamp Catalogue Ed ted by Theresa M Clark and Hugh M Clark (Scott) Il strates and describes every gove nment-issued postage stamp in the world A new edition is pub l shed eve y year All stamps are sold or traded on the bas s of catalogue price Ind spensable to the collector

Sanabria s Air Post Catalogue Compiled and edited by Nicolas Sanabria and H M Konwiser (N colas Sanabria Inc 1948)

Coins

Coin Collecting By Joseph Coffin (Coward McCann 1939) A guidebook for the beginner which is interesting read ng Contains a glossary of terms a l st of dealers and a b bl ography dealing with numismatics

Standard Catalogue of U S Coin and Currency Edited by Wayte Raymond (Raymond) From 1652 to the present day Revised annually G ves pr ces

Coins of the World Ed ted by Wayte Raymond (Ray mond 1948) Twentieth-century issues A complete list of all the coins issued by the countr es of the whole world their colonies or dependenc es There are illustrat ons of most of the types and the average valuat on among collectors is g ven

Swimming

Swimming By Robert J H Kiphuth (Barnes 1942) This book emphas zes compet t ve swimm ng from the standpoint of the team The author is the sw mming coach at Yale University

Learning to Swim in 12 Easy Steps By Adolph Kiefer M lton Gabrielsen and Bramwell Gabrielsen Illustrated (Prent ce Hall 1951) A pract cal readable book on the bas c principles of swimm ng Specific direct ons for teach ing the crawl back crawl and butterfly strokes The authors are well known coaches and teachers of swimm ng

Swimming Fundamentals By Matt Mann and Charles C Fr es Illustrated (Prentice Hall, 1940) In s mple d rect style this book analyzes strokes and d ving fundamentals

Skating

Roller Skating By Bob Mart n Illustrated (Barnes 1944) Includes chapters on forward skating backward skat ing preparation for skate-dancing figure skating etc The



These two hobbyists know all the faraway places of the world through their stamps Philately (stamp collecting) is a favorite activity for all ages.

first book on the subject. Author's aim is to present instructions for learning to roller skate in the international style.

Maribel Y. Vinson's Primer of Figure Skating. Illustrated. (Whittlesey, 1938.) The ABC of this fascinating sport from the first strokes on the ice to the dances — the waltz, fox trot, tango, etc., usually skated in clubs as well as in rinks.

Wings on My Feet. By Sonja Henie (Prentice-Hall, 1940.) Fundamental instructions for skating and school figures, with action pictures. Includes a biographical sketch of the author.

Advanced Figure Skating. By Maribel Y. Vinson. Illustrated. (Whittlesey, 1940.) Standard advanced school figures, dances, and skating show production. Includes chapters on the history of skating and the author's personal background

Championship Figure Skating. By Gustave Lussi and Maurice Richards. Illustrated (Barnes, 1951.) An informative basic guide for any boy or girl who has an interest in skating.

Skiing

Swing Into Skiing. By Arnold Fawcus. Illustrated by Tyler Micoleau. (Harcourt, 1947.) "The simplest and most logical method of skiing that has yet been devised." The author prepared the original draft of the 'American Military Ski Manual'. He is well known in ski circles.

Downhill Skiing. By Otto Lang. Revised edition with new pictures. (Holt, 1946.) "Speed is the thrill, but control is the art." Foreword by Hannes Schneider.

The Complete Ski Manual. By Eddie Huber and Norman Rogers. Illustrated. (Prentice-Hall, 1946.) "How to begin, how to improve, how to excel." History of skiing, ski making, ski jumping. Glossary of terms.



The grace and skill of this lovely figure skater makes her a champion in this spectacular winter sport.

Skiing Naturally. By Frank Harper. Illustrated. (Wyn, 1949.) "Understand every step before trying it" is the author's advice to the beginner.

Skiing for the Millions. By Frank Harper. Illustrated. (Longmans, 1945.) This is a readable introduction to the greatest winter sport by the author of 'The Military Ski Manual'.

American Skiing. By Otto Eugene Schniebs. Illustrated. (Dutton, 1940.) Describes and demonstrates skiing exercises and terms. It is devoted entirely to American technique and terrain.

Archery

Archery. By Natalie Reichart and Gilman Keasey. Revised edition. (Barnes, 1940.) Modern methods in the fundamentals of target archery.

Target Archery. By Robert P. Elmer. (Knopf, 1946.) A new and revised edition of a standard work by the foremost authority in the country. Contains also a history of the sport with all American records.

Fencing

The Art of the Foil. By Luigi Barbasetti. (Dutton, 1932.) "Contains a complete and authoritative presentation of the theory and technique of fencing with a foil, with a short history of fencing."

Fencing. By Joseph Vince. Illustrated. (Barnes, 1940.) Combines the best features of the French and Italian schools in foil, and the Hungarian-Italian saber school with the author's own methods in teaching the use of the foil, the épée, and the saber. Brief history of fencing.

Guns and Shooting

Rifle Marksmanship. By William L. Stephens. (Barnes, 1941.) For beginners and for marksmen endeavoring to improve their score.

The Amateur Gun Craftsman. By James V. Howe. Illustrated. (Funk, 1938.) A practical book for amateurs who work with guns and keep them in prime condition.

Gun Collecting. By Charles E. Chapel. Illustrated (Coward-McCann, 1939.) Tells what types of guns are valuable, how to arrange, repair and photograph them. Reveals the story behind the guns. The author is an internationally recognized authority on arms history.

The Gun Collector's Handbook of Values. By Charles E. Chapel. Illustrated. (Coward-McCann, 1947.) Describes about 2,000 American and foreign firearms and assigns values to them.

Fishing

Boys' Guide to Fishing. By K. and E. E. Morton. Illustrated. (Greenberg, 1947.) Answers any boy's questions about salt-water fish, fresh-water fish, bait and tackle Reliable information. Many pictures. Attractive format

Streamside Guide to Naturals and Their Imitations By Art Flick. Illustrated (Putnam, 1947.) A pocket-sized book based on long, intensive study of flies. Colored plates of May flies.

Western Trout. By Syl MacDowell. Illustrated. (Knopf, 1948.) Includes every species of trout to be found in western waters from the rare golden to the steelhead. An illuminating book for any reader.

Just Fishing. By Ray Bergman. (Knopf, 1943.) "Covers all the eastern fresh-water game fish with particularly fine chapters on trout, bass, pike, and pickerel fishing, land-locked salmon, lake trout. The author is an expert and the book is extremely well written."

Field Book of Fresh-Water Angling. By John Alden Knight. (Putnam, 1944.) A pocket-size book dealing with angling methods, the purchase and care of tackle, etc.

The Complete Fly Tier. By Reuben R. Cross. (Dodd, 1950.) Tells how to make your own dry flies, wet flies, nymphs, and buck tails.

Fly Tying. By William Bayard Sturgis. (Scribner, 1940.) "Deals with brook trout, brown trout, steelhead, and salmon; wet flies, dry flies, hair-wing flies, nymphs, and the latest patterns in use from the East to the West Coast."

Salt Water Fishing. By Van Campen Heilner. (Knopf, 1943.) Tells where to go, at what season, and what tackle to use for each fish. Illustrated in color by W. G. Lawrence.

Golf

Golf. By Patty Berg and Mark Cox. Illustrated (Barnes, 1950.) Describes by pictures and text the build-up of Patty Berg's championship playing.

Championship Golf. By Mildred "Babe" Didriksen Zaharias. Illustrated. (Barnes, 1948.) Outlines the practice and procedure for a sound golf game. A personal approach by the winner of the Women's Championships of both the United States and Britain. Excellent photographs.

Power Golf By Ben Hogan Fully illustrated (Barnes 1948) For both novice and expert

Tennis

Tennis Made Easy By Lloyd Budge Illustrated (Barnes 1945) A simple direct method of learning the fundamentals of the game Introduction by Don Budge

How to Win at Tennis By Jack Kramer (Prentice-Hall 1950) By the Wimbledon champion of 1947

How to Play Better Tennis By William T Tilden Illustrated (Simon & Schuster 1950) The author is a champion with a world record

Tennis By Helen Hull Jacobs Illustrated (Barnes 1941) Clear directions based on the experience of a champion player

Track and Field Sports

Track and Field By Ray Conger Illustrated (Barnes 1939) A famous Olympic star and well known coach discusses track and field fundamentals

Field Hockey for Girls By Josephine Lees Illustrated (Barnes 1942) Individual play in relation to team play For beginners and coaches

Championship Technique in Track and Field By Dean B Cromwell and A P Wesson Illustrated (Whittlesey 1949) A book for athletic coaches and spectators Emphasizes that each athlete has an *individual style*

Pop Warner's Book for Boys By G S Warner (Dodd 1945) Contains chapters on baseball football track and field athletics and basketball A popular book for younger boys

Baseball

Baseball for Everyone By Joe D Maggio with an Advisory Board of Experts (including Frankie Frisch Bill Dickey Carl Hubbell Art Fletcher) (Whittlesey 1948) A treasury of baseball lore and instruction for fans and players Illustrated with line drawings and photographs A revealing story of the favorite national game by its most outstanding exponent Readable and informative

Baseball By John W Coombs New revised edition Illustrated (Prentice-Hall 1951) Individual play and team strategy by the baseball coach of Duke University *Instructions* to scorers have been added Includes official rules of scoring for sand lots or big leagues 100 illustrations

Story of Baseball By John Durant (Hastings House 1947) *Told in pictures* with brief text

Baseball By Robert Smith Drawings by Russell R Gale (Simon & Schuster 1947) An historical narrative of the game the men who play it and its place in American life

Do You Know Your Baseball? By Bill Brandt (Barnes 1947) Baseball history in question form The 50 hottest arguments picked by the author from baseball annals All the records refer to the National League and the American League

How to Pitch By Bob Feller Illustrated (Barnes 1949)

Fundamental Handball By Bernath E Phillips Illustrated Revised edition (Barnes 1940) Includes a section on the one wall game and a synopsis of the four wall softball handball rules A typical biography

Football

How to Play Football By Lynn Waldorf Illustrated (Prentice-Hall 1942) The principles of successful football for the player and for the spectator Presented by the former head coach of Northwestern University

Championship Football By Dana X Bible (Prentice-Hall 1947) A guide for player coach and fan Chapters on watching football scoring, etc

Soccer By Samuel Fralick Illustrated (Barnes 1945) A description of the game with directions for playing it Scores records

Football By William Glenn Kilinger Illustrated (Barnes 1939) For the player and the spectator Fully illustrated with line drawings and photographs

Football Techniques Illustrated By Jim Moore Illustrated by Tyler Micoleau (Barnes 1951) Brief clear instructions for the beginning player and the new coach The illustrations are a special feature of the book

Football Kicking Techniques. By Kenneth E Strong and Lin J E Brodbeck (McGraw 1950) A player's guide to better punting place kicking and drop kicking Foreword by Grantland Rice

Basketball

Winning Basketball By Nat Holman Illustrated (Scribner 1932) The complete manual for the player and the coach

Basketball Illustrated By Howard A Hobson (Barnes 1949) A basic book for coaches as well as a reliable textbook for players Fully illustrated

Winning Basketball Plays Edited by Clair Bee (Barnes, 1950) Tactics and strategy presented in 300 championship plays

Basketball for Girls By Wilhelmine E Messner and Elizabeth Y Meyers Revised edition Illustrated (Barnes 1950)

Boxing and Wrestling

Boxing By Edwin L Haislet Illustrated (Barnes 1940) The techniques and skills of boxing clearly presented

Judo By T Shozo Kuwashima Enlarged and revised edition Illustrated (Prentice-Hall 1943) A book on Jujutsu very popular among boys of junior high-school age

Jiujutsu By Frederick Paul Lowell (Barnes 1947) The art of unarmed self-defense Illustrated with excellent photographs

Games

The Game Book By Margaret E Mulac Illustrated (Harper 1946) Includes many party games and ideas card tricks carnivals Also special programs water games and suggestions for equipping recreation centers

Games for Younger Children By Marian A Webb (Morrow 1947) A hundred games for parties

Town and Country Games By Robert North Illustrated by Garry MacKenzie (Crowell 1947) Two hundred games for outdoors and indoors singing games mystery stunts riddles etc Attractive format For younger children

Fun with Puzzles By Joseph Leeming Illustrated by Jessie Robinson (Lippincott 1946) A book for informal parties Puzzles of every kind for everybody Cut-out and put-together puzzles Anagrams and word puzzles

Horses and Riding

Heads Up—Heels Down By C W Anderson Illustrated (Macmillan 1944) A handbook of horsemanship and riding Includes the care and handling of a horse by the novice who must be his own stable boy Illustrated by the author

Roping By Bernard S Mason Illustrated (Barnes 1940) Chapters on ropes and roping rope spinning trick knots with a lariat roping exhibitions

Riding By Benjamin Lewis (Garden City 1938)

Fun on Horseback By Margaret Cabell Self Illustrated (Barnes 1945) Games and gymkhana Covers breaking and training of colts trail riding etc

Album of Horses By Marguerite Henry Illustrated by Wesley Dennis (Rand 1951) Excellent descriptive text covering many familiar breeds of horses Full page illustrations in color and many marginal drawings

Thoroughbreds By C W Anderson (Macmillan 1942) The value of good breeding shown in sketches of individual horses Detailed drawings show horses in action and the points by which they are judged

The Horse His Gait, Points and Conformation By Paul Brown (Scribner 1943) Simple direct text with many pencil *drawings*

Horses Their Selection Care and Handling By Margaret Cabell Self Illustrated (Barnes 1943) The results of 30 years experience Familiar breeds of horses feeding grooming costs Includes chapters on first aid the showring etc The author has also written Teaching the Young to Ride an excellent book for children

The Art of Riding By Lieut Col M F McTaggart (Scribner 1936) A textbook for beginners and others Part I contains a clear exposition of the forward seat in jumping Part II covers care and training of mounts stabling *etc Finely illustrated*

Horsemanship. By Margaret Cabell Self. Illustrated with photographs and with diagrams and drawings by Sarah Mason. (Barnes, 1952.) Covers methods of training the horse and the rider and the progressive steps from elementary to advanced jumping. Fritz Steckin, trainer and rider of Olympic horses, contributes the chapter on advanced dressage and haute école. The appendix, glossary, and bibliography are of special value.

Dogs

So You're Going to Get a Puppy. By Col. S. St. P. Meek. (Knopf, 1947.) A dog lover's handbook based on long personal experience. Readable at any age. Answers many everyday questions.

Know Your Dog. By John H. Hickey and P. A. Beach. Illustrated. (Harper, 1947.) Includes spaniels, setters, sheep dogs, sled dogs and other breeds. Chapters on care and training. Also on bench shows, field trials, and classification of dogs in the United States, England, France, Spain, and Germany.



To get fun and affection from a pet, its owner must carefully train it and care for it regularly.

How to Raise a Dog in the City and the Suburbs. By Dr. James R. Kinney and Ann Honeycutt. Illustrated by James Thurber. (Simon and Schuster, 1947.) First published in 1938, this book has been a very popular one. Dr. Kinney, the chief veterinarian of the Ellin Speyer Prince Hospital, gives specific information applying to all breeds and answers many questions. Delightful illustrations.

Training You to Train Your Dog. By Blanche Saunders. Illustrated. (Doubleday, 1946.) A new approach to training dogs in obedience as companion dogs and as utility dogs.

The Observer's Book of Dogs. By Clifford L. B. Hubbard. Illustrated. (Warne, 1946.) A pocket-size book dealing with 300 breeds and varieties.

The Complete Dog Book. The American Kennel Club. Illustrated. New and revised edition. (Garden City, 1951.) Covers the care, handling, and feeding of dogs. Discusses breeds and standards.

Drawing Dogs. By Diana Thorne. Introduction by Henry B. Quinan. (Studio, 1940.) A picture book of living portraits for dog lovers and an informative book for the artist who wants to know how to draw dogs. By a widely known artist.

The Dog in Training. By Josef Weber. Illustrated (Whittlesey, 1939.) The author's knowledge of the subject stems from personal experience in the methods of training in international schools. He is an outstanding dog trainer and the founder of the Obedience Tests. Includes chapters on the dogs in the army, leading the blind, and protection.

Care of the Dog. By Will Judy. 4th edition. Illustrated (Judy, 1948.) The world seen through a dog's eyes. A very human appeal.

Dog Training Made Easy. By William Cary Duncan. (Little, 1940.) A dog lover who wrote this readable book believes that the dog in the home should be well trained.

The Cocker Spaniel. By Ella B. Moffit. (Judd, 1946) "Complete information on history, development, characteristics, standards for field and bench. Practical advice on raising, training, and handling."

Our Dogs. By C. E. Harbison. New and revised edition (Judd, 1935.) "An outstanding book on practical dog keeping for the novice, with many suggestions for the expert as well."

Cats

Know Your Cat. By John H. Hickey and Priscilla Beach. Illustrated. (Harper, 1946.) Tells how to identify different breeds, how to feed and care for cats and kittens. Includes chapters on shows and standards for pedigreed cats in the United States and Great Britain.

How to Live with a Cat. By Margaret Cooper Gay. Illustrated by Roberta MacDonald. (Simon & Schuster, 1946) An entertaining book as well as a practical one giving all the details of good care. Includes a chapter on cat stories.

Drawing a Cat. By Clare Turlay Newberry. (Studio. 1940.) "Cats do not pose for the artist," says this artist of delightful picture books whose insight into the personality of cats is noted by Thomas Craven in his introduction.

The Care and Handling of Cats. By Doris Bryant. Illustrated. (Ives Washburn, 1944.) A unique manual for modern cat owners by a widely known specialist in the care of pet cats. Covers America's cats, also Siamese cats.

Cats and All About Them. By L. H. Fairchild and Helen G. Fairchild. Illustrated. (Judd, 1947.) The training and habits of cats simply and competently treated. Covers feeding, grooming, registering, and showing.

Pets

Rabbits. By Herbert S. Zim. Pictures by Joy Buba (Morrow, 1948.) Delightful pictures in color illustrate a practical and simple text about rabbits and rabbit raising for younger children.

Turtles. By W. S. Bronson. (Harcourt, 1945) What kinds of turtles make the best pets? This book answers that question and many more. For younger children.

Book of Nature Hobbies. By Ted Pettit. Illustrated by Don Ross. (Didier, 1947.) Contains suggestions for bird watching, wild flower gardening, care of wild animal pets and other nature activities. Excellent directions for setting up hobbies in limited space.

All About Pets. By Margery Williams Bianco. Illustrated from photographs with decorations by Grace Gilkison (Macmillan, 1929.) A readable and reliable little book about the care of rabbits, mice, guinea pigs, birds, turtles, etc For children under ten years old.

Fishes

Fishes and Shells of the Pacific World. By John T. Nichols and Paul Bartsch. Illustrated. (Macmillan, 1945) The first book on fishes and shells of the Pacific area. The authors are from the American Museum of Natural History and the Smithsonian Institution. The outline drawings of fishes are very effective.

Goldfish. By Herbert S. Zim. Pictures by Joy Buba (Morrow, 1947.) Answers the questions of young goldfish owners with clear scientific information and many pictures in color and black and white.

An Aquarium Book for Boys and Girls. By Alfred Morgan Illustrated. (Scribner, 1936.) Tells how to take care of

an aquarium and gives interesting facts about fish frogs and turtles

Exotic Aquarium Fishes By William T Innes Illustrated (Innes 1952) A comprehensive and beautiful book for the identification of species The photographic illustrations in color were made by the author who is the editor of *Aquarium*

North American Game Fishes By Francesca La Monte Illustrated by Janet Roemhild (Doubleday 1945) Game fishes of ponds brooks rivers and seas presented nontechnically by the associate curator of fishes at the American Museum of Natural History A small book with color plates

Goldfish Varieties and Water Gardens By William Thornton Innes Illustrated (Innes 1947) The latest edition of this reliable and fully illustrated *guide to goldfish and* aquaria Contains new material on water gardens with water lilies in color

Fishes Their Journeys, and Migrations By Louis Roule Introduction by William Beebe (Norton 1933) An unusual book which presents one of the most interesting phases of fish life

Tropical Fishes as Pets By Christopher W Coates *Revised edition Illustrated* (Laveright 1950) A practical reliable book about how to raise and care for tropical fish in a *home aquarium* The author is curator of the New York Aquarium The photographs by S C Dunton include several in color

Tropical Fish as a Hobby By Herbert R Axelrod Illustrated (McGraw 1952) A well-organized readable book Tells how fish get their names and includes lively discussions of individual fish Reference chart lists popular and scientific names Excellent bibliographies

The Seashore

Sea and Shore *By Clarence John Hylander (Macmillan 1950)* A clear scientific explanation with drawings and photographs that stimulate curiosity and interest in marine life

Florida Sea Shells By Bertha D E Aldrich and Ethel Snyder (Houghton 1936) Contains chapters on the romance of the beaches the history of mollusks etc There are some very practical suggestions for collecting and mounting shells

A Field Guide to the Shells of Our Atlantic Coast By Percy A Morris Illustrated (Houghton 1947) The range of this book is from Maine to Florida The clear descriptions of size distribution color and distinctive markings with natural-color photographs make identification easy

Let's Go to the Seashore By Harriet E Huntington (Doubleday 1941) Starfish and sea urchins periwinkles and crabs presented in a picture book for young children

The Seashore Book for Children. By Thornton Burgess (Little 1929) The most complete book of seashore life for young children The color plates are admirable and there is an appendix for the identification of specimens which is useful at any age

West Coast Shells By Josiah Keep (Stanford Univ Press 1935) A description in familiar terms of the principal marine fresh water and land mollusks of the United States British Columbia and Alaska found west of the Sierras

Birds

Birds of America Edited by T Gilbert Pearson Illustrated (Garden City 1936) A large-size authoritative book on the birds of North America written and illustrated by leading ornithologists and artists Accurate scientific data Illuminating accounts of characteristics Hundreds of line drawings and photographs and over 100 full page color plates from paintings by Louis Agassiz Fuertes

Birds in Their Homes By Addison Webb Pictures by Sabra Mallett Kimball (Garden City 1947) A most attractive book for younger children Information reliable Illustrations in color

Starlings Written and illustrated by W S Bronson (Harcourt 1948) Contains a wealth of bird lore in true-to-life pictures and simple text for younger children

Audubon Bird Guide Eastern Land Birds *By Richard H* Pough Illustrated in color by Don Eckelberry (Doubleday, 1946) Contains a good bibliography

Natural History of the Birds of Eastern *and Central North* America By Edward H Forbush Revised and abridged *with the addition* of more than 100 species by John R May Illustrated in color by Louis Agassiz Fuertes Allan Brooks and Roger Tory Peterson (Houghton 1939) The life history and an accurate description of every bird to be found east of the Dakotas Nebraska and Kansas Includes Florida and Canada

Book of the Pigeon By Carl A Naether Illustrated Third edition (McKay 1944) Up-to-date information on *every phase of* pigeon keeping Includes rare foreign varieties racing pigeons and an interesting bibliography of *pigeon literature*

Birds By Herbert S Zim and Ira N Gabrielson Illustrated by James Gordon Irving (Simon & Schuster 1949) A pocket guide to American birds Includes range maps

A Field Guide to Birds By Roger T Peterson (Houghton 1947) Revised edition An interesting way of looking at birds *by the presentation* of their color value as they appear in flight Gives fieldmarks of all species found east of the Rockies New plates and information included

A Field Guide to Western Birds By Roger T *Peterson* (Houghton 1941) Covers the Rocky Mountain states the Pacific states the Pacific Northwest and Southwest, emphasizing distinguishing characteristics of the birds when seen at a distance

Familiar Birds of the Pacific Southwest By Florence V V Dickey (Stanford Univ Press 1935)

Birds of the Ocean a Handbook for Voyagers By W B Alexander (Putnam 1928) Notes on habits foods and migration of sea birds

An Introduction to Birds By John Kieran Illustrated by Don Eckelberry (Garden City 1950) A nature lover invites friendly acquaintance with the more common of the native birds of North America Picture book size illustrations are in full color

Bird Guide Land Birds East of the Rockies By C A Reed (Doubleday 1926) Pocket-sized book with colored illustrations brief description of habits songs nests range etc Identification key by conspicuous markings

Reptiles

The Reptiles of North America By Raymond L Ditmars Illustrated (Doubleday 1936) The crocodilians lizards snakes turtles and tortoises in the United States and northern Mexico A revision and extension of "The Reptile Book published more than 30 years ago Many species have been added also new color plates and photographs from life

A Field Book of North American Snakes By Raymond L Ditmars Illustrated. (Doubleday 1946) Snakes of northeastern southeastern and western sections

Snakes of the World By Raymond L Ditmars With illustrations from life (Macmillan 1938) A book largely based on questions about snakes With the remarkable photographs are authentic and interesting descriptive notes

Snakes Alive and How They Live By Clifford H Pope Illustrated with photographs (Viking 1946) Contains an illustrated key for the identification of the snakes of the United States A fascinating book

Geology

Minerals By Herbert S Zim and Elizabeth K Cooper (Harcourt 1943) Their identification uses and how to collect them A book of living interest effectively illustrated

The Field Book of Common Rocks and Minerals By Frederic B Loomis (Putnam 1923) Contains colored plates and many illustrations from photographs taken by the author to aid in identification

The Earth, Our Ever Changing Planet By Chester A Reeds. Illustrated (University Society 1936) This book contains chapters on historical resumé of geology the lithosphere earthquakes volcanoes etc The author is curator of geology at the American Museum of Natural History

Earth's Adventures The Story of Geology for Young People By Carroll Lane Fenton Illustrated (Day 1942) A nontechnical geology by a well known specialist contains A nontechnical geology by a well known specialist contains an excellent up-to-date bibliography Along the Hill is an excellent up-to-date bibliography

a pocket-size book about common rocks, minerals, and fossils by the same author

Fossils. By Richard Swann Lull Illustrated (University Society, 1931.) "What they tell us of plants and animals of the past" The director of Peabody Museum of Yale University gives a remarkably clear presentation for the reader without technical background

Butterflies and Bugs

Grass Roots Jungles. By Edwin Way Teale Illustrated Revised edition (Dodd, 1944) Based on the author's discoveries in his backyard A popular book with older boys



These children are learning more about their hobby of collecting butterflies by examining wings under a microscope.

American Butterflies and Moths. By Cecile Hulse Matschat Illustrated by Rudolph Freund (Random, 1942) Excellent for identification and study of species Authentic drawings in color. An attractive book.

The Grasshopper Book. By Wilfrid S. Bronson. Illustrated by the author. (Harcourt, 1943) Includes chapters on crickets, katydids, and the praying mantis. Incidents drawn from the author's observation of grasshoppers and crickets kept in cages will fascinate young children.

The Butterfly Book. By W. J. Holland. (Doubleday, 1947.) A popular guide to the butterflies of North America, first published in 1907. Full-page color plates.

Insects. By Herbert S Zim and Charles Cottam. Illustrated by James Gordon Irving (Simon & Schuster, 1951.) Pocket-size guide to familiar American insects Contains a key to insect groups Includes butterflies and moths

Field Book of Insects. By Frank E. Lutz (Putnam, 1935) This is not intended for children but it is nevertheless a valuable handbook for amateur entomologists young and old. This author's 'A Lot of Insects' (Putnam, 1941) will attract younger children.

Fabre's Book of Insects. Retold from Alexander Teixeira de Mattos' translation of Fabre's 'Souvenirs Entomologiques' by Mrs Rodolph Stawell Illustrated by E. J. Detmold. (Dodd, 1921) The beautiful color plates for this book and for 'Insect Adventures', which is also retold from 'Souvenirs Entomologiques', give it a unique place

Wild Flowers, Ferns, and Trees

Wild-Flower Guide. Northeastern and Midland United States. By Edgar T. Wherry. Illustrated by Tabea Hofmann. (Doubleday, 1948.) Technically accurate but easy to follow. Suggests how plants can be cultivated An appendix classifies flowers according to color and also introduces wild flowers of other countries. The author is professor of botany at the University of Pennsylvania

Trees of the Eastern United States and Canada. By William M Harlow Illustrated. (Whittlesey, 1942) Woodcraft and wildlife uses of trees are given special attention in this attractive book. Many illustrations are in color

Plants. By Herbert S. Zim. Illustrated by J. W. Brainerd (Harcourt, 1947) A guide to plant hobbies Gives a survey of the entire plant world by an amateur in this field, who is well known for his books of science The book has a list of places in the United States which are of particular interest to the plant enthusiast It is easy to read and contains excellent reading lists for the various subjects

Desert Parade. By William H. Carr Illustrated by Marvin H. Frost (Viking, 1947.) This valuable, practical guide to the plants and wildlife of the Southwest is illustrated with unusual photographs by the author, who was the former associate curator of the American Museum of Natural History and is now president of Arizona Wild-Life Federation.

Indian Harvest. By Jannette May Lucas Illustrated by Helene Carter (Lippincott, 1945) The wild food plants of America clearly described and effectively illustrated.

Field Book of Western Wild Flowers By Margaret Armstrong in collaboration with J. J. Thornber. Plates in color, black, and white (Putnam, 1915) The common wild flowers growing west of the Rockies are pictured and described

Flowers of Coast and Sierra. By E G Clements. (Wilson, 1928) Popular account of most common flowers of the Pacific coast from Southern California to Washington.

An Introduction to Wild Flowers. By John Kieran. Illustrated by Tabea Hofmann (Doubleday, 1952.) Wild flowers presented in the approximate order in which they come into bloom by the same nature lover who wrote 'An Introduction to Birds'. The illustrations in color are exceptionally good. The artist is well known for her authentic drawings and paintings of flowers.

Field Book of American Wild Flowers. By F. Schuyler Mathews. Colored plates and illustrations in pen and ink. (Putnam Rev. ed., 1929.) Classified by month with clear descriptions of the characters and habits of flowers, and references to insects which help fertilize them. A standard work with good illustrations.

Field Book of American Trees and Shrubs. By F. Schuyler Mathews (Putnam, 1915) Standard guide to trees Descriptions and maps show their general distribution

Trees of California. By W. L. Jepson. (Sather Gate Book Shop, Berkeley, Calif., 1923.) "The best book for California in our collection."—*Los Angeles Public Library*

Flowers of Prairie and Woodland. By Edith S Clement Illustrated with color plates. (H. W. Wilson Co., 1947) Life-size pictures of the flowers in color. Many of the paintings were made on the spot.

A First Book of Tree Identification. By Matilda Rogers Photographs by Wynn Hammer. (Random, 1951.) Excellent photographs of the branches and leaves of 31 common varieties with clear descriptive text. Includes chapter on the barks of various trees

American Trees. By R. T. Limbach. Introduction by T. H. Everett. (Random, 1942) Picture-book size. Contains 55 different kinds of trees. Authentic drawings and paintings in color by the author-artist.

The Complete Guide to North American Trees. By C. C Curtis and S. C. Bausor. New Home Library (Garden City,

1943) A well-arranged guide for the identification of trees in which the leaf is the principal key to recognition

Gardens

American Garden Flowers By Gladys Pratt Freund *Illustrated by Rudolf Freund* (Random 1942) Readable description of 63 familiar garden flowers vines and shrubs accompanied by full page color plates

Garden Flowers in Color By Daniel J Foley (Macmillan, 1945) A picture encyclopedia of flowers

In Yards and Gardens By Margaret Waring Buck (Abingdon Cokesbury 1952) Based on the author-artist's year-round observation of the birds butterflies frogs turtles flowers trees and vegetables in her own garden and checked by the American Museum of Natural History for *authenticity of text and pictures Planned to interest* younger children

Spice and Scent Written and illustrated by Lee Mar l (Coward McCann 1943) Herbs in fact and fun y An attractive little book in which rosemary parsley lavender and other herbs are to be found

Where Did Your Garden Grow? By *Jannette* May Lucas *Illustrations* by Helene Carter (Lippincott 1939) All the flowers in your garden were once wild flowers in some part *of the world* The maps and p ctures in color show them in their original habitat and on their travels

A Book of Garden Flowers By Margaret McKenny and Edith F Johnston (Macmillan 1941) Paintings in color of 35 garden flowers accompan ed by brief text in nontechnical language

Plants in the City By Herman and Nina Schneider *Illustrated by Cynthia Koehler* (Day 1951) Indoor gardening Clear information on city ways of city plants *Exper ments* with beans and seeds

Garden Guide The Amateur Gardener's Handbook Ed *ited by A T De La Mare 7th edition* Rewritten and greatly enlarged (Dodd 1947) A comprehensive and reliable book dealing with the flowers fruits vegetables the bees birds and fish of the Northern and Middle States and California

Arrangement of Flowers By Mrs Walter R Hine (*Scribner 1940*) Deals with three schools of flower arrangement also d scusses table decorations and flower containers Fine uncolored *illustrations*

Picture Primer of Indoor Gardening By Margaret O Goldsmith *Illustrated* by Harrie Wood (Houghton 1946) The science and art of indoor gardens *A most attractive* book in *full* color

Astronomy

Picture Book of Astronomy By Jerome S Meyer Illustrated by Richard Floethe (Lothrop 1945) A fascinating book for any age but of spec al interest to the younger *children*

Sun, Moon and Stars By W T Skilling and R S Rich ardson Illustrated (Whittlesey 1946) Covers the planets the stars, and devotes a section to Astronomers and Observa tories Designed for beginners The book is written in an informal style attractive to older boys and girls Dr Richardson *is at* Mount *Wilson Observatory*

Astronomy from a Dipper By Eliot C Clarke (Hough ton 1909) The simplest and clearest book on astronomy Charts supplied by the author make it easy to find the pos tion of the other constellations from the B g Dipper

Introducing the Constellations By Robert H Baker (*Viking 1937*) *A companion volume to* When the Stars Come Out in which the whole pageant of the skies is pre-sented with sim lar pictorial features

The Stars for Sam By William Maxwell Reed Edited by Charles E St John Decorations by Karl Moseley (Harcourt 1941) An astronomy which rests on new con ceptions of time *space* and matter treated with clarity and imagination Contains a chapter on E nstein For boys and girls of *junior high school* age

When the Stars Come Out By Robert Baker Illustrated with photographs maps and charts Decorations by Boris Artzybasheff (Viking 1934) The arresting character of its pictorial features and the *recent developments covered* give th s book a special claim in rous ng genuine interest in astronomy among older girls and boys Includes a descrip-tion of the Adler Planetarium

Science

Everyday Weather and How It Works By Herman Schneider *Illustrated* by Jeanne Bend ck (Whittlesey 1951) Tells how to read weather maps and how to make a home weather forecasting station Answers many questions

Boy s Book of Modern Science By S M Jennings *Illustrated* by I N Steinberg (World Pub 1951) Includes nuclear fission mi roscopes Diesel engines A compre-hensive book for older boys

Boys Book of Science and Construction By Alfred P Morgan Illustrated New and revised edition (Lothrop 1948) Scientific facts and natural phenomena including rockets jet motors Diesel engines radar and atom c energy Many experiments

Chemistry

Open Door to Chemistry By John L *Horning and George* C McGinn s Illustrated by Helen Armstrong (Appleton 1946) First steps in chemistry with s mple *experiments*

Experiments in Science By Nelson F Beeler and Frank lyn M Branley Illustrated by Ruth Beck (*Crowell 1947*) S mple experiments Directions for making a periscope a m v e etc clearly set forth by two teachers in *schools for* boys

Fun with Chemistry By Mae and Ira Freeman (Random 1944) S mple experiments

First Chemistry Book for Boys and Girls By Alfred P Morgan Illustrated by Bradford Babb tt and Terry Smith (Scribner 1950) Describes 64 different experiments with clear directions for performing them and a list of the chemicals required Chem stry as a hobby is filled with adventure

Physics

Picture Book of Molecules and Atoms By Jerome S Meyer Illustrated by R chard Floethe (Lothrop 1947) The fundamentals of modern atomic science in clear language with interpretative illustrations in color Will stimulate the imag nation of adults as well as that of ch ldren A book which naturalizes physics as a subject in early ch ldhood

Explaining the Atom By Sel g Hecht Illustrated (Vik ing 1947) Bas c phys cs for the layman showing the de-velopment *in physics during* the past fifty yea s A small readable book wh ch supplies background for the problems of atomic energy

Young People's Book of Atomic Energy By Robert D Potter Illustrated (Dodd 1948)

Atom cs for the Millions By Maxwell L Eidinoff and Hyman Ruchlis Illustrated (Wh ttlesey 1947) Clear nontechnical statement of basic principles behind the devel opment of atomic energy Traces this development from its beginnings

Invitation to Experiment. By Ira M Freeman Illustrated by Mae and Ira Freeman (Dutton 1940) A nontechnical presentation of physics in concise form Simple exp eri ments

Physics Tells Why By Overton Luhr Illustrated by Rut C Schmidt Rev sed edition (Ronald 1946) By the comb nat on of animated illustrations and clear state-ment the author has brought to the unmitated the prin ciples of radio television air conditioning ultraviolet rays X rays and cosmic *rays A quiz supplement adds to the* interest of th s book.

Romping Through Physics By Otto Willi Gail Illus trated by Hermann Blank (Knopf 1934) The most obvious facts in physics treated in an ent rely logical sequence A first book The clever drawings in color are based on things *every child should* know

Physics of Today By J A Clark and others (Houghton 1943) The fundamental laws and prin ples of physics are clearly set forth The experiments are illustrated by many d agrams

Adventures with a Microscope. By Richard Headstrom. (Lippincott, 1941.) A series of projects in the first use of the microscope by an experienced scientist

Working with the Microscope. By Julian D Corrington. (Whittlesey, 1941.) In a series of exercises in the mounting of materials for observation under the microscope explanations are made as simple as possible Designed for amateurs working alone or in a club. Well indexed. Gives sources of supplies. Reference tables.

Fun with Your Microscope. By Raymond F. Yates. (Appleton, 1943.)

Photography

Fun with Your Camera. By Jacob Deschin. (Whittlesey, 1947.) For camera enthusiasts. Contains information on prize contests and exhibitions. Lists annual contests for professional and amateur.

Pictorial Continuity. By Arthur L. Gaskill and D A. Englander. (Duell, 1947.) A clear, technical yet readable introduction to making movies. For the teen-age and amateur.

Table-top Photography. By Henry G. Russell. (Transatlantic Arts, 1947.) How to create a scene and photograph it. Of special interest to camera clubs.

Flash Photography. By Gordon Parks. (Grosset, 1947.) A detailed and well-illustrated account of each phase of flash photography.

Photography for All. By Duane Featherstonhaugh. (Barnes & Noble, 1947.) A most complete book for the amateur which explains in a clear manner the many tricks by which the beginner will always get his picture.

A Guide to Better Photography. By Berenice Abbott. Illustrated. (Crown, 1941.) One of the foremost photographers of the country shows how to make better photographs. The book covers all the subjects and techniques from choosing your camera to documentary and exhibition work. Unusual photographic illustrations from the work of masters of the art. A thrilling book.

This Is Photography. By Thomas H. Miller and Wyatt Brummitt. Illustrated. (Garden City, 1946.) The authors are expert practical photographers of the Eastman Kodak Company. Readable and informed. Includes advice on choosing equipment, color photography, etc.

Photography for Teen-Agers. By Lucile Robertson Marshall. Illustrated. (Prentice-Hall, 1951.) Concise reliable information presented in a lively form covering every phase from the box camera to flash bulbs, movie making, and the use of color films.

The Fun of Photography. By Mario and Mabel Scacheri. (Harcourt, 1938.) Explains the principles of successful photography with emphasis on the mind behind the lens; 375 half-tone illustrations. Brilliant and instructive.

Electricity

Electronics for Young People. Written and illustrated by Jeanne Bendick. (Whittlesey, 1947.) An introduction to atomic theory and modern power. An earlier edition was called 'Electronics for Boys and Girls'. This book includes new material on radar, atomic energy, and nuclear power.

The Boy Electrician. By Alfred P. Morgan. Illustrated. New revised edition. (Lothrop, 1948) Clear explanation of principles of electricity. All plans tested and the apparatus built by boys. From the simplest equipment to radios and complex motors.

Electronics in Action. By James Stokley. (Whittlesey, 1946.) Nontechnical.

Experiments with Electricity. By Nelson F. Beeler and Franklin M. Branley Illustrated. (Crowell, 1949.) How to make an electric buzzer, a secret door lock, an electric motor, etc.

First Electrical Book for Boys. By Alfred P. Morgan. (Scribner, 1951.) A well-illustrated, easy-to-read book on simple principles of electricity.

Elementary Electricity. By Edgar P. Slack. Revised edition. (McGraw, 1943.) Treatment based on modern electron theory. Elements of direct and alternating currents. Used in vocational and electrical schools.

Boy and a Battery. By Raymond F. Yates. Illustrated (Harper, 1942.) Tells how to construct an electric battery, how to revive and control one. Very popular with boys.

Radio and Television

Modern Radio. By Kingdon S. Tyler. Illustrated. (Harcourt, 1944.) Explains each operation from the studio to the broadcast receiver. Chapters on television and radar.

Telecasting and Color. By Kingdon S. Tyler. Illustrated by James MacDonald. (Harcourt, 1946.) Basic principles of television in black and white. Contains a good list of books on the subject. Chapters on colored television.

Radio for the Millions. By the Editorial Staff of *Popular Science Monthly.* Illustrated. (Grosset, 1943.) Tells how to be a radio builder and lists in detail whatever parts are needed to build a particular set.

Here Is Television. Your Window to the World. Thomas H. Hutchinson. Illustrated. (Hastings House, 1947.) A comprehensive account of television with a forecast of the development. Nontechnical. For the professional as well as the lay reader.

Television Works Like This. By Jeanne and Robert Bendick. (Whittlesey, 1949) A graphic presentation in words and pictures. Lists special terms used with an accurate definition of each. Takes reader backstage of a television show.

Television Story. By John Floherty. Illustrated. (Lippincott, 1951.) "Radio and television are electronic sisters. Let's call one Audible and the other Visible," says the author of a book which answers many questions in an interesting way.

The Boys' Book of Communications. By Raymond E. Yates. Illustrated. (Harper, 1942.) Clear directions for constructing model sets.

The Radio Amateur's Handbook. (American Radio Relay League.) Revised annually. Contains elementary data but gives the latest developments, including television and shortwave transmission and reception.

Radar. By Orrin E. Dunlap. Illustrated. (Harper, 1946) What radar is and how it works. The author traces the history of radar from the early wave experiences of Hertz and Marconi through the application of the radio echo to push button in wartime. Scientifically accurate. Very readable

Television Techniques. By Hoyland Bettinger. (Harper, 1947.) Covers television writing and programing. While technical, it is not beyond the layman. Comprehensive diagrams.

The Future of Television. By Orrin E. Dunlap. Revised edition. (Harper, 1947.) The appendix gives the historic steps in television from 1867 to March 1947. The author was radio editor of the *New York Times* from 1922 to 1940, later on the executive staff of R.C.A.

Magic

Professional Magic for Amateurs. By Walter B. Gibson. (Garden City, 1947.) A good basic book for the hobbyist of any age. Selection of tricks from simple to difficult.

Learn Magic. By Henry Hay. Illustrated by Hans Jelinek. (Garden City, 1947.) Tells how to watch a magician and how to be a magician. Book list. Suggests magical outfits.

The Real Book About Magic. By Joseph Leeming. Illustrated. (Garden City, 1951.) Magic tricks with simple props, coins, rings, handkerchiefs, strings, ropes, etc.

Magic for Entertaining. By John Mulholland. (Grosset, 1948.) First published as 'The Art of Illusion: Magic for Men to Do'. "A beginning book for older boys eliminating sleight of hand," the author says. Simple explanations

Illustrated Magic. By Ottokar Fischer. Translated and edited by J. B. Mussey and Fulton Oursler. Illustrated. (Macmillan, 1951.) A magician of international reputation explains the secrets of magical apparatus. Fulton Oursler's introduction, The Magic of Today, is illustrated with pictures of leading magicians and their special contributions to the art.

Magic Tricks. By John Scarne. (Crown, 1951.) A book for older boys and adults by a magician who has created a number of games.

Magic By Barrows Mussey Illustrated (Barnes 1942) Simple conjuring tricks and stunts presented in an entertaining way

Modern Magic Manual By Jean Hugard (Harper 1939) Introduction by Julian J Proskauer The author was one of vaudeville's famous performers of magic and knew many of the secrets of Houdini Kellar and Thurston

Camping and Hiking

Hiking Camping, and Mountaineering By Roland C Gesst (Harper 1913) A well-organized book with good bibliographies The mountaineering section is of special interest It contains a glossary of mountaineering terms and a list of hiking and mountaineering clubs of North America

Camping and Woodcraft By Horace Kephart (Macmillan 1921) 'The most comprehensive book on living in the open ever published'

Let's Go Camping By Harry Zarchy Illustrated (Knopf 1951) A practical book for the beginning camper Includes chapters on cooking first aid in the woods edible plants etc

The Hiker's Handbook By Douglas Leechman (Norton 1944) A practical and readable book for anyone who makes a hobby of walking Includes walks in the city long hikes, chapter on hiking clubs youth hostels in various parts of the world laws and regulations for hikers

The Canoe By Robert E Pinkerton (Macmillan 1923) Its selection care and use

Camp Cooking By Horace Kephart (Macmillan 1951) What foods to take How to skin dress and keep game and fish Gives recipes and time tables for cooking based on long experience

The Junior Book of Camping and Woodcraft By Bernard S Mason (Barnes 1943) A large-size book very fully illustrated with drawings and many excellent photographs of camp life Designed for inexperienced campers and has immediate appeal for younger children

Summer's Children By Barbara Morgan (Morgan & Morgan Scarsdale N Y 1951) A picture sequence of life at camp with a brief history of summer camps Very beautiful photographs by an artist who has caught the life of each activity in its natural setting

Camping Can Be Fun By Robert W Weaver and Anthony F Merrill (Harper, 1948) An up-to-date book suggesting new equipment for outdoor living which has come out of the second World War

How to Live in the Woods By Homer Halstead (Little 1948) Simple and practical

Log Cabins By William Swanson Illustrated (Macmillan 1948) Includes plans for ski huts stone and timber lodges, rustic furniture etc Interesting approach

Handbook of American Mountaineering By Kenneth A Henderson Illustrated (Houghton 1942) The American Alpine Club's handbook The first book to deal specifically with American mountains Includes practical descriptions of climbing technique

Cooking

The Boston Cooking School Book By Fannie M Farmer Revised with illustrations (Little 1951) A widely known standard cookbook which gives temperatures and time schedules and takes account of modern refrigeration The Fannie Farmer Junior Cookbook (Little 1946) is a shorter and simpler book It includes a chapter on candymaking

The Joy of Cooking By Irma S Rombauer Revised and enlarged edition (Bobbs 1951) A generous combination of reliable recipes with excellent occasional comment Well organized easy to use and very popular A Cookbook for Girls and Boys (Bobbs 1946) contains fewer recipes

Fun with Cooking By Mae Blacker Freeman Illustrated (Random 1947) For beginners The recipes are for things children like to eat Picture book size Large photographs

1001 Sandwiches By Florence A Cowles (Little 1949) New ideas and clear directions for making a great variety of sandwiches for picnics parties school lunches As suggestive to adults as to girls and boys

Young America's Cookbook Compiled by the Home Institute of the *New York Herald Tribune* (Scribner 1938)



This young leather worker is reviving the skill of an ancient craft as she cuts materials for a tooled leather purse

Each recipe is part of a plan for a picnic a family meal a camping trip a party Includes candymaking and outdoor cooking Effectively illustrated in color and very popular

Candy and Candy Making By Mary B Bookmeyer (Bennett, 1929) For the home candymaker Clear and comprehensive

Handicrafts

Handicraft for Girls By Edwin T Hamilton (Dodd 1932) A most attractive well illustrated book Contains chapters on hooked rugs lino-block printing batik art-metal jewelry leathercraft and other subjects of interest to older girls There is an excellent bibliography

The Complete Book of Sewing By Constance Talbot (Greystone 1943) An invaluable book for older girls who are doing their own sewing and dressmaking

Design and Sew By Mariska Karasz Drawings by Christine Engler (Lippincott 1946) For girls in the teens A design for your figure age and individuality Practical and interesting

My Room Is My Hobby Written and illustrated by Marion Downer (Lothrop 1942) A fascinating book dealing with color carpentry work curtains etc Tells how to build a stage model and has a chapter on paper sculpture

Let's Make a Lot of Things By Harry Zarchy Illustrated (Knopf 1948) Crafts for home school and camp Step-by-step instructions and clearly drawn diagrams for making a variety of things from metals clay and leather

The Art of Chinese Paper Folding By Maying Soong (Harcourt 1948) Clear directions and diagrams for making miniature boats tents chairs tables and party novelties without scissors or paste

Weaving for Amateurs By Helen Coates Illustrated Revised edition (Studio 1941) Chapters on simple weaving dyeing spinning varieties of weaving materials etc

Amateur Handcraft. By F C Hughes (Bruce 1947) Various projects in wood and metals



The satisfaction of making things with their hands keeps these boys busy for hours in their basement carpentry shop.

Holiday Cards for You to Make. By Edith Flack Ackley. Illustrated. (Lippincott, 1940) A practical book for the amateur and hobbyist. Fully illustrated.

How to Make Dolls and Doll Houses. By Tina Lee. Illustrated by Manning Lee. (Doubleday, 1948.) Patterns for making dolls of all sizes. Attractive pictures in color.

Jewelry, Gem Cutting, and Metalcraft. By William T. Baxter. Revised edition. Illustrated. (Whittlesey, 1942.) An interesting book on a popular hobby. Includes a chapter on the identification of gem stones and minerals.

Arts and Crafts. By Marguerite Ickis (Barnes, 1943.) Basic techniques for bookbinding, weaving, leathercrafts, pottery making, etc.

Popular Crafts for Boys. By Edwin T. Hamilton. (Dodd, 1935.) "Step-by-step instructions with accompanying line sketches have been given for making at least one article of each craft: carpentry, mask making, lino-block printing, bookbinding, leathercraft, pottery craft, tin-can craft, miniature modeling, trick photography, soap sculpture, paper mosaics, plastic wood modeling, art metalcraft, wood carving."

Make It and Ride It. By C. J. Maginley Illustrated. (Harcourt, 1949) Concise directions with diagrams for making bike trailers, wagons, scooters, jeeps, etc. Contains a section on racers for the Soap Box Derby.

Dolls to Make for Fun and Profit. By Edith Flack Ackley. (Lippincott, 1951.) A practical guide for making dolls and dolls' clothes.

The Wise Handbook of Knitting and Crocheting. By Miriam Morrison Peake. Illustrated (Wise, 1949.) Clear and complete instructions for knitting and crocheting, including materials, basic stitches and designs for every sort of garment and accessory for girls, boys, and adults.

Carpentry

Child's Book of Carpentry. Written and illustrated by Jeanne Taylor. (Greenberg, 1948.) Clear directions and illustrations in color for constructing a boat, a bookcase, a chest, a picture frame, etc. The selection and handling of the tools are presented in a way that will interest younger children.

Tools and How to Use Them for Woodworking and Metalworking. Written and illustrated by Alfred P. Morgan. (Crown, 1948.) Full, clear directions for the purchase, the use, and the care of up-to-date tools. A practical handbook for amateurs. Experienced carpenters and metalworkers will respect it. The author is the owner of one of the largest tool collections in the United States.

Historic Models of Early America. By C. J. Maginley. Illustrated. (Harcourt, 1947.) Explicit directions for the construction of models of an oxcart, a log canoe, a horsecar an early bicycle, the first Ford, the first airplane, etc.

Carpentry for the Building Trades. By E. A. Lair. Illustrated. (McGraw, 1947.) Covers all phases of carpentry for high schools, technical and vocational schools Up-to-date in treatment. Author is instructor in Building Trades, Jacksonville (Illinois) High School. Includes a list of visual aids, blueprints, etc

Homemade Games. By Arthur Lawson. With a foreword by Angelo Patri. (Lippincott, 1934.) Instructions for building as well as playing shuffleboard, badminton, tether ball, cockamaroo, table tennis, and other popular games The index includes a classification of games and the number of players required for each game. A suggestive book which will prove helpful to camp leaders as well as to boys.

Outdoor Handicraft for Boys. By A Neely Hall. (Lippincott, 1938.) A variety of projects which can be made with simple tools—ski board, aquaplane, diving raft, trailers for bicycles, etc.

Woodworking as a Hobby. By Emanuele Stieri. Illustrated. (Harper, 1939.) Clear directions for the selection and use of both hand and power tools in the construction and reconstruction of furniture, cabinets, bookshelves, etc.

The Boy Builder. By Edwin T. Hamilton. (Dodd, 1933) Contains full directions for making more than 100 articles out of wood with explanations of each tool and its use. The plans by the author were tested by boys before they were included in the book. Up-to-date diagrams and drawings.

The Carpenter's Tool Chest. By Thomas Hibben. Illustrated by the author. (Lippincott, 1933.) A well-written and delightfully illustrated book designed to give children clear ideas of the development of tools and the work of carpenters down the ages.

Railroads

Diesel-Electric 4030. Written and illustrated by Henry Billings. (Viking, 1950.) The construction of Diesel-electric locomotives is explained in detail in descriptive text and superb drawings. The author rides in the cab of the Pacemaker of the New York Central Railroad from Harmon to Albany and describes exactly what happens along the route.

The Modern Wonder Book of Trains and Railroading. By Norman Carlisle. Illustrated. (Winston, 1946) From the first locomotive to model railroading. Readable text

Boys' Book of Model Railroading. By Raymond F. Yates Illustrated (Harper, 1951.) Clear, concise instructions for the construction and care of a model railroad and for creating the surrounding scenery.

Iron Horses: American Locomotives 1829-1900. By E P. Alexander. Illustrated. (Norton, 1941.) A pictorial story of the development of the American locomotive from the first engine to run on rails. A large-size book illustrated with reproductions from authentic prints and lithographs. Clear descriptive text includes a list of locomotive builders of the United States.

Riding the Rails. By Elizabeth Olds. (Houghton, 1948) The true story of the building of American railroads vividly told and illustrated in color. A notable picture book.

Model Railroads. By Edwin P. Alexander. Illustrated. (Norton, 1940) The first comprehensive book on scale model railroading, including planning, construction, and operation. Exceptional illustrations and plans. For older boys and men.

Trains, Tracks, and Travel. By T. W. Van Metre. 7th revised edition. (Simmons-Boardman, 1950.) A completely satisfying book on railroads and transportation for boys 10 years old and older by an authority on the subject.

Trains By Robert Selph Henry (Bobbs 1950) The story of the development of American railroads and railroading told in a way to interest older boys and their fathers Numerous photographic illustrations and a historical pictorial map indicating railroad routes supplement the text

Engineering

High Wide and Deep By John J Floherty Illustrated (Lippincott 1952) Science and adventure with the U S Coast and Geodetic Survey Unusual photographs of surveyors setting up their instruments on the sea and mountainside

Underneath New York By Harry Granick Diagrams by Philip W May (Rinehart 1947) The first book to describe the anatomy of a modern city and apply technical imagination to historical data Effectively illustrated

The Boys' Book of Engines Motors and Turbines Written and illustrated by Alfred Morgan (Scribner 1947) About railroad locomotives airplane engines Diesel engines electric motors etc Simple plans for making toy motors and engines

Everyday Machines and How They Work By Herman Schneider Illustrated by Jeanne Bendick (Whittlesey 1950) Clear explanations of all kinds of household machines and devices including electric toasters pressure cookers vacuum cleaners bubble lamps musical instruments More than 300 effective pictures

It Works Like This By Capt Burr Leyson Illustrated (Dutton 1942) Discusses automobile engines Diesel engines etc

What Engineers Do an Outline of Construction By Walter D Binger (Norton 1938) The story of what has been accomplished in the fields of civil engineering and construction told by an engineer who knows the men ideas and materials he writes about

Drawing and Modeling

The Natural Way to Draw By Kimon Nicolaides (Houghton 1941) An original working plan for art study designed to carry a student through one year Free of the academic it leads to creative work within the capacity of the student An inspiring book for boys and girls who have a definite interest in art Fully illustrated

Sketching as a Hobby By A L Guptill (Harper 1936) Written with an eye to popularizing drawing for fun without neglecting technical information The author is a widely known art instructor

Making Pottery By Walter A de Sager (Studio 1934) One of the several titles in the suggestive How to Do It series issued by Studio Publications

Making Water Colors Behave Illustrated By Eliot O Hara (Putnam 1932) A book written primarily for beginners in water color Contains a partial bibliography of useful books for the water colorist

Animal Drawing By John R Skeaping (Studio 1941) A beautiful book illustrated with the author s drawings and with a selection from other animal drawings

The Art of Lettering By Carl Lars Svensen (Van Nostrand 1947) Contains a large number of plates of ancient and modern alphabets Gives the elements of lettering tools materials etc

Discovering Design By Marion Downer Illustrated (Lothrop 1947) Design is everywhere but not everyone can see it This book is so clear in text and illustration that it appeals to any age

How I Make Woodcuts and Wood Engravings By Hans A Mueller (Tudor 1945) Highly recommended for students and amateurs The author is a distinguished artist and teacher of the art

Exploring Art By Luise C Kainz and Olive L Riley Illustrated (Harcourt 1947) Art appreciation applied to daily life Presents experiments in color and form Covers the theater painting sculpture the crafts industrial design etc Well chosen illustrations from the fine-arts field and from commercial art are reproduced in color and in black and white The authors are well known teachers of art in New York high schools



Fashioning clay into useful and decorative objects is one of the oldest of the arts Here a vase takes shape on a pottery wheel.

Animal X Rays By Brenda Putnam Illustrated (Putnam 1947) Aimed at the young reader The information is so well presented as to be of interest to anyone learning to draw The author is a distinguished American sculptor

Making Linoleum Cuts By Samuel Greenberg (Daye 1947) A large-size book. Photographs and block prints by the author and his students describe every phase of linoleum cutting and printing Text clear and nontechnical The author is art instructor in Chicago high schools

Costume Design By Kay Hardy (McGraw 1948) A practical handbook discussing every phase of the subject Well illustrated

Painting for Enjoyment By Arnold Blanch and Doris Lee (Tudor 1947) Of special interest to the amateur Step-by step examples of methods with many reproductions of the work of other artists Color chart

How to Make Pottery and Ceramic Sculpture By Julia Hamlin Duncan (Simon & Schuster 1947) A good book for beginners or teachers Describes materials simple tools where to get them and how to use them Photographs show techniques

Silk Screen Color Printing By Harry Sternberg Illustrated (McGraw 1942) The youngest of the print-making arts from which many suggestions can be taken including the production of color posters Detailed drawings of the equipment and step by-step illustrations of the process

Painting as a Hobby By S D Thach (Harper 1937) A primer for the amateur An excellent bibliography serves as a guide to further study

Music

The Record Book New International Edition By David Hall (Oliver Durrell Inc 1948) A music lover s guide to the world of the phonograph The most comprehensive guide available to all fine recorded music

The Children's Record Book By Harriet Buxton Barbour and Warren S Freeman (Crown 1947) A useful guide to the best recorded music for children with a list of suggested readings

The Game of Harmony. By Ross Lee Finney. (Harcourt, 1947.) "Harmony is a game that you play all by yourself. Like crossword puzzles it will teach you new words." Author is professor of music at Smith College Ability to read music is taken for granted.

Making an Orchestra. By Dorothy Berliner Commins. Illustrated by David T. Darling. (Macmillan, 1931.) Description of all instruments, also a chart with cut-outs to set up a small orchestra on paper.

The Road to Music. By Nicolas Slonimsky. Illustrated. (Dodd, 1947.) A lively and reliable introduction to music, beginning with the musical alphabet and ending with jazz, swing, and boogie-woogie.

Broadcasting Music. By Ernest La Prade. (Rinehart, 1947.) Contains book list.

Adventures in Symphonic Music. By Edward Downes. Decorations by John O'Hara Cosgrave II. (Rinehart, 1944.) An attractive book for young listeners to broadcasts or records. Represents the work of 58 different composers.

What Makes an Orchestra. By Jan B. Balet. (Oxford, 1951.) An original presentation of the players as well as the musical instruments. A picture book in color with lively informative text



No play preparation is complete without stage make-up for the actors. Costume and cosmetics change these modern youths into old-time gypsies and bandits.

Tune Up. The Instruments of the Orchestra and Their Makers. By H. E. Huntington. (Doubleday, 1942.) Large detailed pictures on each page show the instruments—percussion, wood winds, brasses, or strings held in the hands of a young player. Clear step-by-step text showing the development of the instruments.

The Junior Music Quiz. By Gladys Burch and Helmut Ripperger. (Schirmer, 1940.) An ingenious book of musical games. The last question in each quiz is concerned with the music that follows it.

A Treasury of Gilbert and Sullivan. Edited by Deems Taylor. Arrangements by Dr. Albert Sirmay. (Simon & Schuster, 1941.) The words and music of 102 songs from 11 operettas. A book for the whole family.

First Steps in Playing and Composing. By Satis N. Coleman. (Day, 1930.) A very practical book which can be used easily with younger children.

Alice in Orchestralia. By Ernest La Prade. (Doubleday, 1925.) A novel way of presenting the modern symphony orchestra. The author was a member of the orchestra which first gave symphony concerts for young people.

Fun with Flutes. By David Dushkin. Book design and illustrations by Alfred D. Sterges. (Univ. of Chicago Press, 1934.) Tells in a very clear, delightful way how to make and play a flute. Contains a number of selections of music arranged for the flute. An original book with excellent working drawings.

Song Books

The Songs We Sing. By Hendrik Willem van Loon. With music arranged by Grace Castagnetta. (Simon & Schuster, 1936.) Traditional nursery songs illustrated with lively drawings in color. Contains an excellent introduction to music. Very popular with young children.

The Flower Drum and Other Chinese Songs. Illustrated. By Chin-Hsin, Yao Chen, and Shih-Hsiang Chen. Foreword by Pearl Buck. (Day, 1943.) "The best introduction that I know to the style and charm of Chinese folk music for Westerners," says Henry Cowell. Words in Chinese and English with piano arrangements in the style in which Chinese instruments accompany singers. Illustrations from authentic Chinese prints.

Songs and Games of the Americas. Collected and translated by Frank Henius. Illustrated by Oscar Fabres (Scribner, 1943.) Words and music of folk songs and directions for playing old Spanish games known to the children of Latin-American countries.

Folk Song U.S.A. Collected, adapted, and arranged by John A. Lomax and Alan Lomax. Music edited by Charles Seeger and Ruth Crawford Seeger. (Duell, 1948.) "The 111 best American ballads" with illuminating descriptive notes on their sources. Contains a selected list of books on American folklore and a list of record albums. A book of permanent interest and value in any family.

The Spanish-American Song and Game Book. Illustrated. Compiled by workers of the Writers' Program, Music Program, and Art Program of the Works Projects Administration in the state of New Mexico. (Barnes, 1942.) A variety of characteristic games and songs from Sweet Orange to New Mexico Hockey presented in Spanish and in English.

Songs of American Folks. Collected by Satis N. Coleman and Adolph Bregman. Illustrated by Alanson Hewes. (Day, 1942.) A well-chosen, delightfully presented collection by well-known authorities.

Sing It Yourself. By Dorothy Gordon. (Dutton, 1928.) A collection of folk songs from "The Young People's Concert Hour" with interesting notes about them.

Fireside Book of Folk Songs. Edited by Margaret Bradford Boni. Arranged for the piano by Norman Lloyd Illustrated by Alice and Martin Provensen. (Simon & Schuster, 1947.) A large collection of well-chosen songs including ballads, work songs, both English and American, marching songs, Christmas carols, old hymns and spirituals.

Dancing

How to Become a Good Dancer. By Arthur Murray. (Simon & Schuster, 1947.) The art of dancing presented by a leading contemporary authority. Illustrations and diagrams are explicit in every detail. The one-step, the waltz, the tango, the rhumba, the fox trot, and swing dances are considered. For young people and adults.

Folk Dances and Singing Games. Twenty-six folk dances. Described and edited by Elizabeth Burchenal. Revised edition. (Schirmer, 1933.) Music and full directions for performance and many illustrations are included. 'Dances of the People' is a second volume of 'Folk Dances and Singing Games'. (Schirmer, 1934.)



The backstage crew in a play has just as much fun as the actors These girl artists are making the first sketches for what will turn out to be an effective backdrop

The Dance By John J Martin Illustrated (Tudor 1947) The story of the dance told in pictures and in text by the dance critic of the *New York Times* 260 action photographs The book is in four parts Basic Dance Dance for the Sake of the Dance Folk Dancing and Ball room Dance as a Spectacle

The Ballet Lover's Pocket Book By Kay Ambrose Illustrated (Knopf 1945) A small profusely illustrated book calculated to increase understanding of the art of ballet

Play Production

Face the Footlights! By E B (Zeke) Colvan Illustrated (Whittlesey 1940) A practical approach to acting The author has had many years of directing experience Discusses breathing habits make-up how to study a part diction etc

Producing the Play By John Gassner with the New Scene Technician s Hand Book by Philip Barber (Dryden 1941) Two books in one Combines the aesthetic and practical aspects of the subject Includes a bibliography and notable contributions based on production procedures For young people

Acting The First Six Lessons By Richard Boleslavski (Theatre Arts 1933) Dialogues between a would be actress and a well known producer in which he stresses the importance of concentrat on memory of emot on dramatic action characterization observation and rhythm

The Art of Play Production By John Dolman Jr Revised edit on Illustrated (Harper 1946) Full treatment of the practical phases of acting directing and staging *A* standard book in wh ch the illustrations are an important feature

The Play Book By Jean Carter and Jess Ogden Illustrated (Harcourt 1937) An elementary book on stage technique with nine plays of various types Includes a list of plays

Practical Stage Directing for Amateurs By Emerson Taylor (Dutton 1916) A simple clear and comprehensive handbook for the amateur director and actor

Costuming a Play By El zabeth B Grimball and Rhea Wells Designs by Rhea Wells (Appleton, 1925) Clear d rect ons for des gning costumes with particular emphasis on materials and color Contains also a brief history of costume and excellent plates showing changes in l ne and silhouette from the early Assyrian to the Civil War period

Costuming the Amateur Show By Dorothy Lynne Saunders Illustrated (French 1937) This handbook for amateur producers gives detailed instructions for making a wide variety of costumes and special information in relation to stage properties

Stage Scenery and Lighting By Samuel Selden and H D Sellman (Appleton 1936) A comprehensive and practical handbook by two technical d rectors—one of the Carolina Play makers the other of the Univers ty of Iowa Theatre Conta ns chapters on scenery design and painting

Lighting the Stage with Home Made Equipment By Jack Stuart Knapp (Baker 1946) Clear explanation of l ghting and direct ons for making equipment for those who have limited funds or who seldom produce

Play Production By Milton Sm th Illustrated by William Steinel (Appleton 1948) Up-to-date practical d rections covering all phases of play production Prepared for use in little theaters schools and colleges Illustrations are in full color

Marionettes

Remo Bufano s Book of Puppetry Edited and compiled by Arthur Rich mond Illustrated by Remo Bufano (Macmillan 1950) Contains the full text of Be a Puppet Showman *and also* the plays Remo Bufano wrote for the marionette theater Includes both hand and string puppets and a short history of puppetry New methods of construction and advice have been added since the death of Remo Bufano who was the creator of the most original work in this field in America The most important book on the subject

Marionettes By Edith Flack Ackley (Lippincott 1929) The best single book on cloth marionettes Contains chapters on making a simple stage on making cardboard properties and on costuming marionettes as well as on cutting and sewing the bod es Good patterns are included Younger *children like this book*

Handbook of Fist Puppets By Bess e A Ficklen (Lippincott, 1935) Compares fist puppets and marionettes gives history of fist puppets tells how to make them dress and act them suggests types of plays

Easy Puppets By Gertrude Pels Illustrated by Albert Pels (Crowell 1951) Directions for making and using hand puppets out of simple materials at home Includes chapters on papier maché heads and a variety of stage sets *A fam y book*

Marionettes a Hobby for Everyone By Mabel F and Leslie Beaton Illustrated. (Crowell 1948) Excellent from the practical how-to-do-it angle Everything is shown in clear photographs and diagrams Does not include hand puppets The authors base their work on 15 years of amateur puppet shows in Rye New York.

Puppetry An International Yearbook of Puppets and Marionettes Edited by Paul McPharlin Published annual ly (Hastings House) A l mited edit on of Mexican Folk Puppets Trad tional and Modern with drawings by Lola Cueto and text by Roberto Lago was published in 1941

Marionettes Are People By Edith Thane Illustrated by George Alan Swanson (Duell 1948) An original approach to making and enjoying marionettes off stage Includes full-scale patterns and a list of materials.

The Puppet Theatre Handbook By Marjorie Batchelder Illustrated by Douglas Anderson (Harper 1947) A comprehensive technical handbook covering the production of puppet shows and the construct on of all types of puppets Based on the varied experiences of Paul McPharl n and others Excellent b bliography

A FAST PLAY AT THE GOAL CAGE



In this action picture, we see the heavy padding and gloves worn by ice-hockey players to protect them. The white-sweatered goalie (on knee) is trying to block the puck that has been shot at the goal by a dark-sweatered opponent.

HOCKEY. The object of this game, which is played with curved sticks, is to drive a disk (puck) or a ball through the opposing team's goal. The puck is used in *ice hockey;* the ball, in *field hockey.*

Ice hockey of a sort may have begun as early as the 18th century in northern England. But today's fast and furious game originated in Canada—probably at Kingston Military College, Ontario, in 1876. In 1895 Canada introduced its national winter sport to the state of Maryland, and during the late 1920's, indoor rinks of artificial ice rapidly spread the game throughout the United States.

Meanwhile, in 1908, a professional league sprang up in Canada. From this grew the National Hockey League (organized 1917), which was strictly Canadian until Boston joined it in 1924. Each year, teams of this league play for the Stanley Cup, emblematic of the world championship. This cup was donated by Lord Frederick Stanley in 1893, when he was governor-general of Canada. Today, professionals are paid as much as $15,000 a season. They are in their prime from 24 to 30; their playing life averages ten years.

Most ice-hockey amateurs in the United States play by rules of the National Collegiate Athletic Association, which are similar to professional rules. A team consists of six players—goalie, right and left defense, right and left wing, and center. Substitutions are frequent. A recommended playing area is 200 feet long and 85 feet wide with rounded corners. Lines across the ice divide the area between goals into three equal zones. A goal cage, 6 feet wide, 4 feet high, and from 17 to 22 inches deep, is centered at each end of the rink at least 10 feet from the end boards. In front of each goal is marked a rectangle, or "crease," into which the puck must precede an attacking player. The puck is a black rubber disk one inch thick and three inches in diameter. It is manipulated with the hooked end of the hockey stick and is passed from player to player. It may slide at 90 miles an hour. A team gets one point when it shoots the puck into the enemy goal.

The game is divided into three 20-minute periods with 10-minute rests between. In case of a tie, one overtime 10-minute period is played. For fouling, a player is sent to the penalty box for 2, 5, or 10 minutes, and the team is short a man until he has served his time. Some infractions call for a penalty shot no closer than 28 feet from the goal line.

The best players have practised from childhood to develop speed, quick thinking, split-second co ordination, and teamwork. Players born in the United States are now winning places on teams that not long ago were entirely Canadian.

Field hockey, probably of ancient Persian origin, was modernized in England by 1875. Thence it came to the United States a few years later. Girls took it up and in 1922 formed the United States Field Hockey Association. A team has 11 players—five forwards, three halfbacks, two backs, and a goal keeper. The field measures not more than 100 by 60 yards. At each end is a goal with an opening 12 feet wide and 7 feet high. The white leather-covered ball is about 9 inches around. When it is driven through the enemy goal, one point is scored. A game is divided into halves of not more than 30 minutes.

HOG. To be likened to a hog or pig is looked upon as an unpardonable insult, because it is understood to imply either greediness or filthiness. Jews and Mohammedans regard the hog as "unclean" and unfit for human food. But the hog is no more greedy than any other animal. It does have a liking for mud baths, since it finds these soothing to its thick skin; but otherwise it prefers being clean, and thrives better when not kept in a "filthy pigsty."

We can judge the hog's value as a food animal from the fact that, even though several religions ban pork as a food, the hog still furnishes a large part of man's flesh food. From ancient times hogs have been maintained as "side lines" on farms, getting part of their living from otherwise useless food scraps, and rooting in field, meadow, and forest for the balance of the food they need. No other animal turns "waste food" into human food so efficiently.

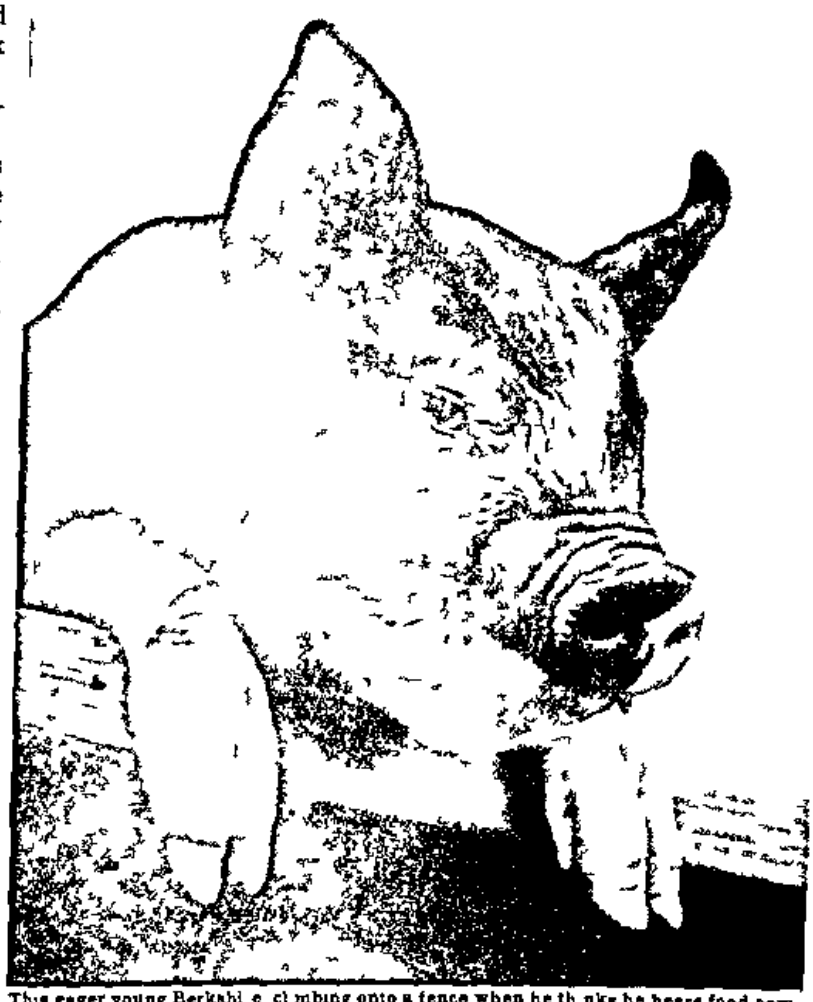
The hog is admirably suited by nature for such use by man. Hogs and their relatives belong to the *Artiodactyla,* or division of hoofed animals having an even number of toes on each foot. Most of these animals, such as deer and cattle, have complex stomachs suited to fibrous vegetable foods (*see* Ruminants), and live on broad stretches of grass or forest land. The hog

has a simple stomach and while it will eat anything, it thrives best on more concentrated vegetable food such as cereals, roots acorns cooked kitchen scraps, and skimmed milk and other waste dairy products

The head is well adapted to grubbing up roots and similar food Except when domestic breeding has changed the shape of the head the hog has a long snout with a fleshy button containing the nostrils on the end, where they can best sniff underground food Each jaw has four tusks all pointing upward although domestic breeding has reduced the tusks in size In wild hogs they aid in digging and self-defense The neck is short and carries the head low A hog's foot has four toes two of them forming the hoof and the outer two ending above the ground except when the foot sinks into mud Jelly like tissue and soft muscle between the bones make 'pigs feet a delicate food

Occasionally, in some parts of the world, the hog has been used as a draft animal In China it is not rare to see a woman a hog a horse, and an ass harnessed together to drag a cart An English hog breeder once drove to a fair with four hogs drawing his carriage Hogs can be trained to perform tricks for they are quick to learn some things In parts of Europe they are trained to find truffles an edible underground fungus

WAS THAT THE DINNER BELL?



This eager young Berkshire climbing onto a fence when he thinks he hears food coming shows to perfection the pig's general attitude He is eager to eat suspicious of the world and quite ready in his pigheaded way to be stubborn.

The hog is almost machine-like in the precision with which it gains weight from its food Through a hog's normal life 3 8 pounds of corn and two fifths of a pound of tankage will increase the hog's weight one pound. American farmers figure on making a profit whenever they can sell 100 pounds of live hog for the price of 11 4 bushels of corn

After hogs are between 6 and 10 months old and from 175 to 225 pounds in weight they gain flesh more slowly, and the flesh becomes too fat to cure into the best grades of ham and bacon They are marketed therefore, at this age unless they are kept for breeding or to meet a special demand for heavy hogs Mature hogs weigh from 600 to 1 000 pounds depending upon sex and breed 'Porker roasting pigs may be marketed when they are 4½ months old and weigh about 100 pounds.

Compared with cattle, hogs are more economical meat producers The dressed carcass of a hog weighs 75 per cent of the live weight a steer yields only 55 per cent In *nine months a sow may* produce 1 500 pounds of finished pork and a litter of roasting pigs In the same time a cow produces one calf that weighs 300 pounds when ready for market

Every part of the hog yields food or some by products The bristles make brushes and the hide makes a leather called pigskin Portions of the small intestine are eaten fried as *chitterlings* the melted fat forms lard for cooking All portions not otherwise used including the blood may be made into fertilizer

The females called *sows* may be bred when 8 or 10 months old and after 16 weeks they produce litters of from 6 to 8 pigs Subsequent litters may contain 10 or 12 pigs The pigs are weaned in about two months then they are called *shoats* or *shotes* A mature male hog is called a *boar*

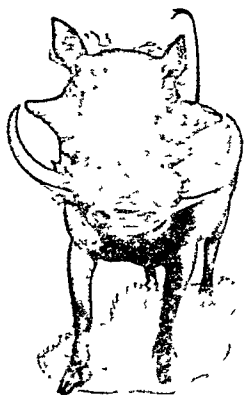
Farmers usually expect two litters a year, about February and August Most sows are clumsy mothers and usually kill some of the pigs by rolling on them and smothering them Only about 56 per cent of all young pigs live to reach the market

Breeds and Types of Hogs

The wild ancestors of the domestic hog appeared in many regions during prehistoric times The domestic

hog has the same scientific name (*Sus scrofa*) as the European wild boar, which probably was its ancestor, with some crossing from Chinese varieties (*see* Boar). Perhaps hogs were first domesticated in China.

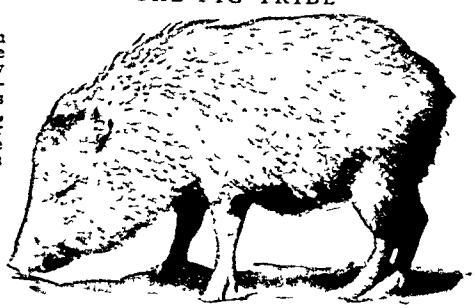
Modern domestic hogs are classed as either the lard type or the bacon type, with several breeds in each type. A bacon hog should have a long body to yield the maximum amount of bacon from the sides; a lard hog has a shorter, stockier body, with more lard and larger hams. In either type the loins should be large, so that the upper hind legs will produce good hams; the less valuable head, neck, and foreshoulders should not be unduly large. The best hams weigh from 12 to 16 pounds, the best sides of bacon from 10 to 12 pounds.



This comical fellow is a male wart hog from Africa. What good his odd looks do him, no one has discovered. Apparently his ancestors just developed into freaks, and the tribe has stayed that way ever since.

TWO WILD ODDITIES OF THE PIG TRIBE

Here is the champion fighter of pigdom, the fierce little peccary of the American tropical forests. Peccaries live and fight in herds, and even a jaguar thinks twice before invading a herd in search of a meal.



The principal American breeds are the reddish Duroc-Jersey, the black Poland China spotted with white, and the Chester Whites. English breeds grown in the United States are the black Berkshires, the Hampshires with a white belt on the foreshoulder, the reddish Tamworths, and the white Yorkshires. The last two are bacon hogs; the others belong to the lard type.

Many diseases attack swine. Most of these can be prevented by keeping the yards clean and the beds dry. Cleanliness alone, however, is of no avail against cholera; but science with its serums is bringing this disease under control. The former loss of some 130 to the thousand has been reduced to between 25 and 30; but the disease still causes losses of from 15 to 20 million dollars a year, depending upon hog prices. Another dangerous disease of hogs is caused by a parasite worm *trichina*, which lodges in the muscles. People can acquire the infection by eating insufficiently cooked pork. Thorough cooking and federal inspection at packing plants are the chief methods for safeguarding people against these dreaded parasites.

Great Hog-Producing Regions

Hogs are raised everywhere in the United States, but principally in the corn states, to use this grain for fattening. Iowa leads in hog production with some 10 or 11 million head, more than one-sixth of the nation's swine. The United States normally produces about 60 million hogs a year, which is about one-fifth to one-sixth of the world's total. But government restrictions and short feed cut the number to some 37 million in 1935. The only region that exceeds the United States is China, with a production of about 76 million a year. Central and southeastern Europe follow with a joint total of about 44 million. Russia and Brazil produce over 20 million head apiece. France leads the smaller producers with about 6 million. Spain, Canada, and the British Isles, with about 5 million apiece, come next. Mexico produces about 4 million and Denmark 3 million. These are averages from 1926 to 1943 and account for over 80 per cent of all the world's swine.

The world export trade in pork products averages about 2½ billion pounds a year. Of this amount, the United States formerly furnished about half; but after 1929, its exports fell to about one-third of the world total. This loss was much less than that suffered by most of the country's exports. Because of the advantages of the United States, particularly its abundant crops of corn for fattening, pork is likely to continue to be one of the nation's leading farm exports. Pork is packed in nearly all parts of the country; the leading centers are Chicago, Kansas City, Omaha, East St. Louis, Sioux City, South St. Paul, and South St. Joseph. (*See* Meat Packing.)

Pork is commonly packed in brine for keeping, but the upper hind legs and cuts from the sides are smoked to make ham and bacon. In England, a "side" of bacon includes the foreshoulder and ham, or gammon; American bacon is cut from the side only. Smoked pork is soaked in a solution of brine, sweetening, and soda nitrate or nitrite (the "sweet western" cure), or the pickle is injected with a syringe. After 20 or 30 days of curing, the meat is smoked over a hardwood fire for a day or more. In dry curing, the meat is packed in a dry pickle, then soaked in water.

The suborder of *Suina*, to which all swine-like creatures belong, is divided into three families: the *Suidae*, which includes hogs and wild boars, the *Tayassuidae*, which includes the fierce little peccaries, and the *Hippopotamidae*, the hippopotamus family. Among the interesting species of wild swine are the long-tusked *Babirussa* of the island of Celebes, the African wart hog, *Phacochoerus africanus;* and the river hogs of the genus *Potamochoerus*, found in Africa and near-by islands. Peccaries are found in northern South America, Mexico, and as far north as Arkansas (*see* Peccary).

A TRIUMPH OF WIT AND SATIRE



This is one of Hogarth's masterly series of engravings called Marriage à la Mode satirizing the follies of the fashionable life of his day The sprawling viscount and his yawning bride stand amid the disorder left by a late party while the old steward makes a gesture of dismay at the sheaf of bills he holds in his hand The painting from which the engraving was made is one of his most successful works in its beauty of light color and composition Notice how faithfully Hogarth brings out details

HOGARTH WILLIAM (1697 1764) Few men have had so keen an eye for the expressions that the human face can register as did the English painter and engraver William Hogarth No artist has reproduced those expressions with more biting irony Charles Lamb calls Hogarth perhaps next to Shakespeare the most inventive genius which this island has produced Hogarth was the first painter of genius born in England All the great national artists before him were men who like Van Dyck had been born abroad

Hogarth was primarily a humorist and satirist He used paints and engraving tools as Molière Fielding and Swift used words He has been called a master of caricature and he did contribute greatly to the development of technique in this field A caricaturist in the modern sense of the word however usually ridicules individuals by exaggerating their conspicuous features Hogarth rarely dealt with individuals Rather he made fun of humanity as a whole satirizing without mercy its weaknesses and vices

In his own day many critics called Hogarth vulgar and thought his art inferior Now he is generally placed high in the history of English art for his masterful technique his originality his superb rendering of costume and setting and above all for the vital humor and humanness of his characters Most of his works are stories on canvas or copper though he also did some excellent portraits

As a boy Hogarth showed a remarkable gift for mimicry and drawing He tells us that his exercises at school were more remarkable for the ornaments which adorned them than for the exercise itself He was apprenticed to a silver plate engraver and at the age of 22 set up as an engraver for himself Soon he began to paint portraits and groups and eventually found his true sphere in ridiculing human folly His practice was to make a series of paintings and from them engravings which were sold by subscription Because printsellers shamelessly pirated his engravings Hogarth was largely instrumental in securing the passage of an engraving copyright act

Among Hogarth's works are the series The Harlot's Progress (1731–32) The Rake's Progress (1735) and Marriage à la Mode (1745) The six original paintings of the latter the Shrimp Girl and portraits of himself and his sister are in London The Metropolitan Museum in New York City has his portrait of Peg Woffington

Hoh'enstaufen. A German noble family of the Middle Ages to which belonged the Emperors from Conrad III (1138–1152) to Conrad IV (1250–1254) inclusive—with the exception of Otto IV (1198–1214), who was a member of the rival house of Welf (*see* Guelfs and Ghibellines). Castle Hohenstaufen, from which the family took its name, was in Swabia. The Hohenstau'en epoch was the most glorious period of medieval Germany, especially the reign of Frederick Barbarossa (1152–1190).

Hoh'enzollern. The castle Zollern (or Hohenzollern), near the Danube River in Swabia (southwestern Germany), was first built by one Count Frederick in the year 980 (rebuilt 1850–67). From him is descended the family which, after 1415, gradually raised Brandenburg-Prussia to the rank of a first-rate power in Europe, and in 1871 founded the German Empire. Frederick II and William II are the most notable members of the family. The castle also gives its name to the tiny province of Hohenzollern (441 square miles; an outlying part of Prussia) which surrounds it. (*See* Prussia.)

Holbein (*hōl'bīn*), **Hans** (1497–1543). In the long ago days when Luther was drifting into his revolt against the Roman Catholic Church, Hans Holbein, a young German artist, left his father's studio in the wealthy old cultured city of Augsburg, to seek his fortune in Basel, Switzerland. His purpose was to furnish illustrations for the wonderful new printed books that were there being published.

The busy Rhine city of Basel boasted in those days "at least one learned man in every house." Among these scholars was the famous Erasmus, who had come to Basel to oversee the publication of the first printed edition of the New Testament in the original Greek, and other works which he had edited. This wise man and the young artist at once struck up a friendship and Holbein drew pictures for a very clever satire, called 'The Praise of Folly' (*Encomium Moriae*), which Erasmus had written for relaxation and which his friends persuaded him to publish. The pictures were quite as clever as the text, and through all the 400 years since that time, whenever 'The Praise of Folly' has been reprinted, Hans Holbein's illustrations have been reprinted with it.

Holbein drew illustrations for many other books also, among them Martin Luther's translation of the Bible into German. He displayed great skill also in other lines. He painted pictures and portraits; he designed stained glass windows; he even drew designs for female costumes! The old saying that artists are born and not made must have been true in the case of Holbein, for without a magic gift from some good fairy, he could hardly, at the early age of 20 years, have excelled in so many lines.

HOLBEIN'S PORTRAIT OF THE KING'S ASTRONOMER



This picture of Nicholas Kratzer, astronomer to Henry VIII, is one of the great series of portraits made by Holbein during his stay in England. *It is now in the Louvre.*

After a time religious strife between Catholics and Protestants became so bitter that life in Basel was very unsettled Then Holbein with a letter from his friend Erasmus to an influential Englishman again set out for a strange land This time he went to London and there met with a favorable reception Later he became court painter to Henry VIII The king's fondness for Holbein has passed into legend When a nobleman complained of the favor shown the artist the king said My lord know that of seven peasants I can easily make seven earls but of the seven earls I cannot make one Holbein!

In England Holbein was known chiefly as a painter of portraits An old account of his services at the court of Henry VIII relates that he painted the portrait of the king life size so well that everyone who looks is astonished since it seems to live as if it moved its head and limbs The account continues He made portraits of the principal folk of the realm in such numbers that it is a matter for wonder how he could ever have finished so many!

Although his life was spent in Switzerland and England Holbein is regarded as a German artist His paintings and drawings are to be found in most of the larger galleries of Europe His Madonna in the Ducal Palace of Darmstadt is one of Germany's masterpieces His most celebrated picture is the portrait of his friend Erasmus in the Louvre Paris The finest collection of the Holbein miniatures is in the Metropolitan Museum of New York City

HOLIDAYS In medieval times most days of celebration were set aside by the church and called Holy Days Gradually the name changed to holidays Modern holidays may honor political leaders or historical events as well as holy persons They are the occasion for parades and other programs and afford a brief vacation The article Festivals lists the chief holidays and festivals

HOLLAND This name properly belongs to two western provinces of the kingdom of the Netherlands—North Holland and South Holland They are the most densely populated of the 11 provinces and contain Amsterdam Rotterdam Haarlem and The Hague Because of the historic economic and political importance of the two provinces the name Holland is often given to the whole kingdom of the Netherlands (*See* Netherlands)

HOLLY During the Christmas season North Americans and many Europeans decorate their homes with wreaths and sprays of holly The bright-red berries and dark green prickly leaves provide a traditional note of Christmas color (*See also* Christmas subhead Evergreens and the Christmas Tree)

There are about 300 species of holly shrubs and trees throughout the world Many but not all are evergreens In some species the leaves are blackish and the berries are yellow or black

The chief North American species known as American holly grows naturally along the Atlantic coast from Massachusetts into Florida and in the Southern States as far west as eastern Texas The trees average 40 to 50 feet in height and the trunk 1 to 2 feet in diameter Only the female trees bear fruit

European or English holly has glossier leaves than American holly and is more ornamental It is cultivated as a garden shrub in America as well as in England Farmers raise it commercially for Christmas decorations in the Puget Sound region The wood of both American and English holly is fine grained and well suited to cabinet work

The scientific name of American holly is *Ilex opaca* The bark is light gray and smooth the leaves simple alternate elliptical or oval with pointed apex and base and sharp spinelike teeth The fruit a small bright-red berry remains on the tree far into winter Scientific name of European holly *Ilex aquifolium*

HOLLYHOCK The tall stalks of the hollyhock with their large leaves and big bright wide-open flowers provide a colorful background for an old fashioned garden They are especially effective growing against a wall or a fence

The hollyhock is a member of the mallow family It is a native of China but had spread as far west as the Holy Land by the time of the Crusades Historians believe it to be the holy mallow which the Crusaders brought back from Palestine to Europe The Pilgrims carried the hollyhock to America

The earliest hollyhocks had single blossoms They were probably rose-pink shading into red and white Today there are magnificent double hollyhocks and colors range from yellow to purple and maroon Hollyhocks love the sun but will grow in partial shade if the light reaches their lower leaves They need well-drained soil It is best to sow the seed in July and transplant the young seedling early the next spring placing the crown a little below the surface The hollyhock will bloom that summer

The scientific name of the hollyhock is *Althaea rosea* flowers about 3 inches across growing on short peduncles from the stalk calyx 5-pointed reinforced by a circle of 6 to 9 bracts petals 5 in number large wedge-shaped convolute in bud stamens numerous united in a tube styles numerous stem tall thick hairy leaves 5- to 7-lobed rough rounded heart-shaped

HOLMES OLIVER WENDELL (1809–1894) When James Russell Lowell chose Holmes to be the first prose writer for the new *Atlantic Monthly* (1857) he declared confidently The success of this magazine rests with Dr Holmes He has written little but you'll see His mind is like a bright mountain stream that has been dammed up in the hills waiting only an outlet to the ocean He has a wonderful store of thought — serious comic pathetic and poetic The delightful essays entitled The Autocrat of the Breakfast Table proved Lowell a true prophet for nothing so witty and wise so humorous and kindly had been produced in America In whatever he wrote Holmes showed a boy's freshness a man's energy and purpose a poet's gift and the high moral tone that marked the work of the great New England writers of his day In putting his

thoughts on paper he lost none of the sparkle and personal charm that made him a celebrity as conversationalist and lecturer.

Dr. Holmes's success as a writer was the more remarkable because writing was not his chief business. He was a busy physician and Harvard professor, who, besides caring for his big practise, made original scientific investigations and wrote medical works. He was born in Cambridge, Mass. His father was a Congregational minister, professor at Harvard, and historian. Holmes himself had the advantages which he said belonged to a man of family—namely, "four or five generations of gentlemen and gentlewomen" back of him, and "the tumbling about in a library as a child." His life was a busy and uniformly successful one, free from startling events or great misfortunes. On graduating from Harvard he studied law; then studied medicine in Boston and in Europe.

His fame as a writer began while he was still in college, with his poem 'Old Ironsides', that saved the old frigate *Constitution* from destruction. The volume that contained the funny 'My Aunt' and the inimitable humorous-pathetic 'Last Leaf' appeared the year that he took his M.D. degree at Harvard. So often was Holmes called upon for verses for special occasions that he has been called the poet laureate of Boston. The reputation that his 'Autocrat of the Breakfast Table' brought him never dimmed. He followed those essays with 'The Professor at the Breakfast Table' and 'The Poet at the Breakfast Table', and found time also to write two novels. Not all Holmes's poetry was humorous, as was 'The Wonderful One-Horse Shay'. Some of it was beautiful and inspiring, like 'The Chambered Nautilus', one of the most widely quoted of poems.

Holmes was greatly loved, for he was wise and witty and at the same time cheerful and kind. He could share his culture with people without showing the slightest hint of chilling superiority. He received many honors both in his own country and in Europe.

Principal works: *Books of poems*—'Songs in Many Keys' (1861); 'Songs of Many Seasons' (1874); 'The Iron Gate' (1880). *Novels*—'Elsie Venner' (1861); 'The Guardian Angel' (1867). *Essays*—'The Autocrat of the Breakfast Table' (1857–58); 'The Professor at the Breakfast Table' (1859); 'The Poet at the Breakfast Table' (1872); 'Over the Teacups' (1891). *Memoirs*—'Memoir of John Lothrop Motley' (1879); 'Life of Ralph Waldo Emerson' (1884).

HOLMES, OLIVER WENDELL, JR. (1841–1935). As a justice of the Supreme Court of the United States, Oliver Wendell Holmes, Jr., became known as "The Great Dissenter." Time after time, when the high court handed down a decision, tall, thin Justice Holmes delivered a "minority opinion," or dissent. His dissents were so sound that they influenced public thought and many later became a part of the law of the land.

Justice Holmes believed the law should change to meet changing social conditions. "It is revolting," he wrote, "to have no better reason for a rule of law than it was so laid down in the time of Henry IV." Acting on this belief, he condemned child labor as uncivilized in the modern community and upheld the right of strikers to form orderly picket lines. Holmes felt that the protection of the law and the Constitution should also be extended to those whose beliefs might be considered dangerous. But though the opinions of Justice Holmes often found him opposing the interests of private property, he was no radical. He believed that, "For most of the things that properly can be called evils in the present state of the law, I think the main remedy is for us to grow more civilized."

"GREAT DISSENTER"



Oliver Wendell Holmes, Jr., won fame in the field of law.

Justice Holmes came from a scholarly family. He was born in Boston on March 8, 1841. His father, although a surgeon, was better known as a writer. Young Holmes was educated in private grammar schools, and at 16 entered Harvard University. Upon graduation in 1861 Holmes enlisted as a lieutenant in the Union Army. Before his war service ended, he was wounded three times and promoted to lieutenant colonel. During the war he was forced to reprimand Abraham Lincoln. The president stood on a wall of Fort Stevens to watch a battle. As bullets flew around Lincoln, Holmes cried, "Get down, you fool!" Lincoln dropped to safety and said, "I'm glad you know how to talk to a civilian."

Holmes studied law at Harvard and was admitted to the bar in 1867. After some private practise, he taught law at Harvard and served as editor of the *American Law Journal* and *Kent's Commentaries on American Law*. In 1881 he wrote 'The Common Law', which is regarded by many as a classic book on the law.

In 1882 Holmes was appointed a justice of the Supreme Court of Massachusetts. In 1902 he was made a justice of the Supreme Court of the United States. He served till he was 91 years old, resigning in 1932. In 1933 President Franklin D. Roosevelt visited the old justice and found him reading Plato. "To improve my mind, Mr. President," explained Justice Holmes.

HOLY ROMAN EMPIRE. It was on Christmas Day of the year 800, when Pope Leo III in the church of St. Peter's in Rome placed a crown on the head of the Frankish king Charlemagne as he knelt in prayer, that the peculiar organization which we call the Holy Roman Empire first came into existence (*see* Charlemagne). Amid the breakup of the Frankish kingdom after Charlemagne's death, the Empire for a time disappeared. It was revived by the Saxon Otto I, king of Germany, in 962. From that time until its final abolition in 1806, the Empire maintained some sort of existence; but in its last three centuries it had become, in the language of the witty Frenchman Voltaire, "neither holy, nor Roman, nor an empire."

In theory the Holy Roman Empire was the counterpart in civil government of the universal Catholic

church in religion Just as God had placed the pope over his church, so, it was reasoned, he had placed the emperor over all kings and princes In practise the Empire after 962 included only Italy and Germany, and a wavering connection with Lorraine, Burgundy, Switzerland, and the Netherlands

In theory the Empire was elective The Golden Bull of 1356, issued by the Emperor Charles IV placed the hereditary right to elect in an Electoral College composed of the archbishops of Mainz Cologne, and Treves (Trier), the King of Bohemia the Count Palatine of the Rhine (Pfalzgraf) the Duke of Saxony, and the Margrave of Brandenburg (Bavaria and Hanover were added later) In practise the election was practically hereditary After the Carolingian and Saxon lines, the imperial crown was worn by the members of the following houses The Franconian or Salian house (1024–1125), the Hohenstaufen (1125–1254), [Great Interregnum 1254–1273], various houses (1273–1347), the Luxemburg Bohemian line (1347–1437), the Hapsburgs (1438–1806, except for one reign, 1740–1745) For further details *see* the article Germany and the biographical articles

An ANCIENT ART *Transformed into a* MODERN SCIENCE

HOME ECONOMICS AND MANAGEMENT From the earliest days of civilization man's home has been one of his strongest interests It provides the basis for well being and happiness and care for the family It kindles pride and the joy of possession Long before there were cities, industries or the many interests of modern life, man was aware of the meaning of home—a cave at the end of the hunt a primitive shack in the forest clearing And for woman throughout the ages home has been the focal point of concern and activity

We might expect, then, that the science which deals with the home—called home economics or domestic science—would have been one of the earliest of all fields of knowledge to develop But, strangely enough this was one of the latest to gain recognition as a special science Not until 50 or 60 years ago did this science, as an independent branch of learning come into existence Ellen H Richards (1842–1911), pioneer of the home economics movement, formed the first home economics association in 1908 to promote the study of the subject in schools

Before that, knowledge about home making had no laboratory save the home itself Choice recipes were handed down in families Mothers taught their daughters how to clean, to cook, to sew The bride patterned her home after her mother's home and managed it as her mother had taught her

But as home making changed with the rapidly changing world, this plan became inadequate Family traditions are little help to the modern homemaker, who deals with a hundred new factors in housekeeping of which her grandmother never heard—electrical and mechanical devices, new systems of marketing new foods, and new methods of preparing and marketing them Home making now is far more interesting and far less enslaving more complicated and yet easier than it ever was before

So to meet these new conditions we have the science of home economics It has become very exact The Bureau of Human Nutrition and Home Economics of the Department of Agriculture conducts surveys to learn the length of time spent on household tasks by women in various types of homes It studies their division of the family budget among the various home needs It also tests foods, textiles, and household equipment, recommending the best and most economical Schools laboratories books newspapers, magazines the radio, and countless mechanical inventions all try to help the homemaker

This science goes over at many points into the realm of art The homemaker must know about colors and fabrics pictures and bric-à brac, furniture and carpets together with such details as the attractive display of food and the arrangement of flowers It touches very deeply the welfare of the world, for home training has been called the mainspring of all effort for the betterment of humankind Since women do most of the buying of commodities, home making has an important bearing on business and industry In short, it is a field of almost unlimited scope and interest.

But for purposes of effectiveness home economics has been organized to cover only certain related subjects, such as shelter, food, clothing, home management child care, and family relationships Shelter involves all the many aspects of our living conditions One who has studied it plans a house or chooses an apartment wisely, with regard for location, convenience of arrangement, proper lighting plumbing, heating, and waste disposal Living conditions have been found to affect vitally the character and the mental qualities of people, as well as their health There should be adequate sunlight, adequate privacy, and a measure of tasteful beauty to enrich our lives Experts have established standards for these things, and they are taught in home economics courses

***Interior* Decoration an Established Vocation**

Interior decoration is another aspect of shelter It has become in itself an elaborate study and an established vocation. The simpler phases of this study include the choice of furniture, draperies, floor coverings, lamps linens, pictures, and other articles They offer a guide to good taste for the person who is furnishing a home More advanced interior decoration includes the study of textiles, of period furniture, art objects, tapestries, and the creative use of colors and materials in beautiful and appropriate interiors

The question of food has many angles in addition to mere cooking Every year brings new evidence of

the relation of health to diet. To plan the meals which provide the necessary elements for good health the housewife must know the chemical content of food. There has been a remarkable education of the public along this line in the past few years, and now almost everyone knows what calories are and which foods contain healthful vitamins.

The Work of the School

A home economics school teaches the functions of all foodstuffs. The student learns how carbohydrates and fats furnish heat and energy, how proteins build muscle and sinew, the regulating effect of water and roughage, the work of minerals in body building, and the part vitamins play in growth and the prevention of disease. She learns how to market wisely to get these nutrients in the best and most economical form. She learns what cooking methods will retain their beneficial qualities, how to preserve them, and how they are properly balanced in a nourishing diet. She also learns how to prepare foods with the least possible waste and how to "save steps" in cooking; how to set a table attractively and how to serve meals properly.

STUDYING CHILD CARE IN COLLEGE



These students of home economics at Stephens College are learning child psychology by watching how children react as they hear a story read.

Recipes and menus have taken on a fascinating variety as home economics experts have used their scientific knowledge and inventiveness in this field. It has been proved that the taste and even the appearance of food, as well as its chemical content, contribute to its effect on the human body. The artistry of the homemaker in making meals attractive has a physical as well as an esthetic value.

Clothing is another of the home's major interests, so this science and art of the home deals with its many problems. School courses usually begin with plain sewing and mending, and extend into every phase of the selection, manufacture, and care of clothing. Whether a woman has studied costume design, millinery, tailoring, and the like, and can make smart clothing herself, or whether she buys the family outfit ready made, she must be able to judge textiles, leathers, felts, furs, and other materials to get the best possible values. Home economics teaches her the characteristics of various fibers and weaves, and tests for adulteration and "loading" in cloth. Explanation of manufacturing processes provides a basis for detecting poor products and poor methods.

Home Management and Planned Spending

Every branch of home economics involves home management in its broadest sense. Home-management units in home economics courses, however, usually include the planning and furnishing of the home in addition to the management of household affairs The latter has to do with budgeting, household accounts, time schedules, the buying of household supplies, cleaning and care of the house, child care, home nursing, laundry work, and the like.

Planned spending of the family income is an important phase of home-management courses. Experts have figured out what percentage of the money should be spent for food, for clothing, for shelter, and for all other things necessary to well-rounded family life. They have made sample budgets for families of various sizes earning various incomes. Ideal budgets, however, seldom fit the need of a given family. Since its expenditures depend upon its tastes and special circumstances, each spending plan must be especially made. A record of past expenditures will be needed. This calls for the keeping of household accounts. Banks, insurance companies, magazines, and department stores often furnish blanks to be used for home bookkeeping.

Even though a family may not adhere to a budget regularly, it will need to check its record of expenditures before assuming any large undertaking —such as payments on a house. Following a plan of systematic saving gives the family a margin to care for emergencies. Home economics authorities advise that the entire family be consulted in making a budgeting plan, so that all may understand the necessity of limiting some expenses to make the income cover all needs. If one member of the family takes more than a just share, the rest will suffer.

Child Care and Home Nursing

All homemaking centers around the well-being of the child. There is no subject in the world on which mothers are so eager for knowledge and help. They realize that the dietitian, the hygienist, the playground expert, and most recently the psychologist, with his scientific understanding of child nature, can help them in this most important of all tasks.

In the schools, girls even in the elementary grades are taught something of child care, for often they are called upon to care for a small brother or sister This work helps to prepare them for the more important business of parenthood

Preparation for Home Nursing

The teaching of home nursing and modern methods of health preservation is a valuable branch of home economics Modern health study has proved that some of the traditional preventives do not keep disease away as was once thought In fact, some old remedies are actually dangerous They may injure health instead of maintaining it, or they place reliance upon measures which do not help.

If serious sickness does come, the advice of a physician should be asked, but certain danger signals should be recognized by the person who is responsible for family health The doctor diagnoses the illness gives prescriptions and general orders but the responsibility of carrying out instructions rests on the home nurse There are important duties other than administering medicine Taking temperature, pulse, and respiration, making the patient comfortable with bed devices, bathing, giving fresh air and sunshine, and limiting the calls of visitors are all important.

Diet is sometimes as important in the treatment of disease and its control as are medicine and surgery Processes of elimination, digestion, and assimilation are very different in sickness from what they are under normal conditions One must know whether the patient needs a liquid, soft, or light diet, and how to prepare them The home nurse should be familiar with drug supplies and first-aid equipment, and helpful remedies should be kept in the home medicine chest Great care should be taken to keep young children from experimenting with these supplies

Social Responsibilities Emphasized

Right attitudes toward home life are developed in family relationships classes. Appreciation of the father's part in providing the income and the mother's part in managing the home is an important aim The responsibility of each member of the family is discussed The importance of such matters as courtesy to parents, help in caring for younger brothers and sisters, care of personal belongings, and fairness in spending only one's share of the family income are pointed out Responsibility to the community and the nation as well as to the home is taught.

A Field of Wide Opportunities

While homemaking in itself is a profession, even if applied only to a small city apartment many people, particularly women, make of it a vocation of wider range There is no field today in which finer opportunities are offered the girl with a natural aptitude for home economics or any of its many branches She may teach of course, either sewing or cooking or any of the other included subjects She may also lecture to groups of women or girls under various auspices She may write on home economics subjects do editorial work for one of the many magazines and newspaper departments devoted to this field, or she may write copy for advertising the many things the housewife buys Many manufacturers of food products and trade associations made up of manufacturers of a certain type of product conduct research departments, demonstration schools, and services of many other kinds for homemakers These offer interesting and lucrative positions to women.

Radio and television have opened up other opportunities Women who prepare and give radio talks on food and homemaking are usually required to have a background of home economics training Specialists in foods may serve a hospital or hotel as dietitian, or manage a tea room or restaurant County home demonstration agents are expert home economists, and various government agencies, such as the Department of Agriculture's Bureau of Human Nutrition and Home Economics, also employ these specialists.

Managing Family Resources for Good Living

EVERYONE enjoys a cheerful, well run home Not everyone, however, knows how to create a home that will be enjoyed equally by all its members Success in home management means far more than having an attractive, comfortable house and a well-fed family. It creates a social, spiritual, and physical environment in which each member can grow in ability, understanding, and ideals It calls for the coöperation of all members of the family, although the mother, as homemaker, is the natural leader.

Home management deals with the use of family resources to achieve good living These resources include time, energy, money, materials and the talents, interests, and abilities of the various members At different periods of history, one resource has been more limited than another. Colonial and pioneer households far from trading centers found materials much scarcer than the time and energy of their large families In modern times all members of a family may be employed or in school Their time and energy may be relatively scarcer than money or materials

Home-management plans require a careful examination of what is available and what is wanted. How much money can be spent? What talents and skills can each person contribute? What standards in food and house care does each desire?

A realistic examination is certain to reveal conflicts between resources and goals Compromises and consideration for the wishes of others are essential. Children may decide to forego mother's fancy desserts if they are more eager for her to have time to join in the family fun Mother may realize that she "inherited" her standard of immaculate housekeeping from a childless aunt. Somewhat less perfect care may be better suited to a household where growing children invite their friends home to play

Usually there isn't enough money for everything. This calls for decisions on which expenditures will

bring the greatest satisfaction. Sometimes a family council reveals that money is going for things nobody really wants. If they adopt without question the conventional standards of the community, they will pay in money, time, and energy for many nonessentials.

Getting the Most and Best for the Money

Care in buying and the use of money is important in home management. The homemaker who develops her judgment, taste, and skill in purchasing is able to contribute greatly to the success of the household.

Food marketing is a regular chore which she can learn by practise. Purchases of furniture, carpets, and the like may not occur often enough to give her adequate experience. She may need to spend considerable thought, study, and shopping time on such purchases. In furnishing a room, she will consider its use as well as its appearance. She will buy those articles really needed and place them for convenience. If a high-school daughter studies in her room, a desk near the window proves a better furniture buy than the ruffled dressing table for which the youngster yearns. In selecting a rug for a family living room the homemaker will pay for good wearing qualities. For a little-used guest room a cheaper rug that is colorful and soft may suit best.

Economical food buying calls for advance planning of menus. The homemaker can save money and marketing time by buying in quantity if her storage and refrigerator space is sufficient. Canning and deep freezing preserve plentiful foods for later use when they are more expensive (*see* Food Preservation). In making menus, she will keep in mind the flavor and appearance of the foods as well as their nutritional balance. (For charts *see* Food; Vitamins.)

Planning Helps Get Everything Done

The homemaker's day and week are so full of tasks that she can manage to handle them competently only by making careful plans and seeing them through.

WAYS TO SAVE TIME, ENERGY, AND STEPS



1. Sitting uses 8 per cent less energy than standing. This homemaker wisely sits at her ironer with dampened clothes within reach in a rolling basket. 2. Here a mother is making a week's school lunches at one time. She is sealing them in a package for deep freezing. 3. This woman saves steps by assembling fresh bed linen and cleaning supplies on the way to clean a room. 4. Window washing goes faster when both hands are used and polishing cloths are handy.

Planning cuts down time-consuming indecision and waste of energy due to skipping from one incomplete task to another. A workable plan has elastic periods—free time or time set aside for tasks that may be omitted. In these minutes the homemaker can make up for mistakes in estimating the duration of a job and for the dozen and one emergencies that arise.

Fixing the time needed for a complete job is often difficult. The work may need to be broken down into separate parts. For instance, a half-hour may be considered ample for setting a table for a dinner party. But if polishing the silver alone requires 20 minutes, the total time is underestimated.

Good management calls for rest periods and for scheduling easy and tiring jobs alternately. It requires consideration of the family's schedules. If the children are to tidy their rooms, the work must be postponed until after school.

Work Simplification

The homemaker's energy is often as limited as

HOW TO REMOVE SPOTS AND STAINS SUCCESSFULLY

ABILITY TO remove spots and stains from clothing, linens, and other household fabrics pays the homemaker well It helps her to keep both family and home looking neat and attractive It prolongs the useful life of garments and home furnishings It cuts down laundry and dry-cleaning bills

A cardinal principle of spot removal is to do the job as soon as possible Pressing over spots with a hot iron may set them So may washing in hot soapy water Many stains come out easily if attacked at once but are stubborn if allowed to age in the fabric

A Shelf of Necessary Supplies

Equipment and supplies to be kept on hand include

A medium-sized bowl of enamel or heat-resistant glass medicine droppers a small glass rod with blunt ends

Material to make absorbent pads—for example old soft face towels or white blotting paper soft clean cloth free from lint for sponging

Cleaning agents A noninflammable cleaning fluid such as carbon tetrachloride a 10 per cent solution of ammonia absorbent powder such as French chalk corn starch fuller s earth or a prepared dry-cleaning powder a bottle of denatured alcohol bleaches glycerin

"Spotting" Techniques

Sponging To sponge with carbon tetrachloride water or other agent put an absorbent pad under the spot Moisten a sponging cloth slightly with the cleaning agent Then sponge l ghtly Use straight strokes and feather out the moisture into the fabric to avoid a ring Do not rub Change the pad and sponging cloth as they become soiled

Bleaching Bleaches may remove color along with spots and may weaken the fabric *They should be used quickly and rinsed out thoroughly with water They should be tested on colored fabrics in a hidden place as under a pocket to see whether the material remains colorfast*

Chlorine bleaches can be used in varying strengths on cotton linen rayon and nylon Note directions on the bottle and follow them carefully

Sodium perborate is one of the best bleaches for all types of materials It is especially good for white woolens Mix four tablespoons of the powder with one pint of *lukewarm water and sponge* the spots Or stretch the stained fabric over a bowl of hot water dampen the stain shake sodium perborate over it allow to stand for one to two minutes then sponge and rinse with water One teaspoon of sodium perborate in one pint of hydrogen peroxide used immediately after mixing will usually remove grass beverage mud scorch and perfume stains

Hydrogen peroxide is a mild bleach for all fabrics Apply it to the stain with a medicine dropper or a glass rod or sponge the spot To make it more effective add a few drops of ammonia a teaspoon of borax or a teaspoon of sodium perborate to a pint of peroxide

Safe Handling of Synthetics Water weakens rayon so treat wet rayon gently If it is necessary to bleach rayon use sodium perborate or hydrogen peroxide by preference A weak chlorine bleach may be satisfactory

Alcohol dissolves acetate rayon If in doubt as to the type of rayon test a seam edge with alcohol before using this agent to remove spots For other types of rayon dilute alcohol with two parts of water

Spots tend to remain on the surface of nylon and can usually be washed off easily with soap and water It is safe to use bleaches on white or colorfast nylon

Special Treatment for Special Stains

Blood Soak washable fabrics in cold water until the stains are light brown Then wash out the stains with warm (not hot) soapy water Fresh blood on unwashable fabrics can sometimes be sponged out with lukewarm water To remove old or stubborn stains use a bleach following carefully the directions under Bleaching

Candle Wax With a dull knife scrape off the caked wax Then insert the stained portion of the material between clean white blotters and press with a warm iron Change the blotters as they become soiled Next sponge the stain with carbon tetrachloride Laundering usually removes any remaining color If the fabric is not washable sponge color stains with denatured alcohol using one part of alcohol in two parts of water

Candy and Other Sweets Spots from sweets that are chiefly sugar often disappear upon gentle sponging with lukewarm water If the candy contained chocolate cream or other fat follow the directions for removing fats If stains remain try the hydrogen peroxide and sodium perborate method described under Bleaching

Chewing Gum Scrape off as much of the gum as possible using a dull knife Sponge away the remainder with carbon tetrachloride

Coffee To remove coffee spots from washable fabrics, stretch the stained part over a bowl not too tightly and secure it with a rubber band Pour boiling water through the stain from a height of at least two feet Rubbing the stains between applications of boiling water may help For coffee spots on wool or silk sponge with lukewarm water Then rub glycerin in lightly and allow it to remain half an hour Rinse with water If the coffee contained cream sponge with carbon tetrachloride

Fat Oil or Grease Spread absorbent powder over fresh still damp spots Shake or brush away the powder when it becomes gummy Repeat as necessary If this method is not successful press the stained material between clean white blotters using a warm iron *Remove* old or stubborn spots from washable fabrics by washing in warm soapsuds Remove such spots from unwashable fabrics by sponging with carbon tetrachloride Sponge on the wrong side with an absorbent pad under the right side

Fruit To remove fruit stains (except peach pear plum and cherry) from washable fabrics use the boiling water method suggested for coffee stains If necessary try hydrogen peroxide sodium perborate or chlorine bleach

Soapy water sets some fruit stains but it may remove spots due to citrus fruit

To remove fruit stains from silk or wool sponge well with cool water Then rub in a small amount of glycerin or soapless shampoo and allow it to remain for several hours Next apply a few drops of vinegar Rinse after a minute or two using clear water Follow this method for peach pear cherry and plum stains on any fabric

Grass and Other Green Plants On washable material use hot water and soap Rub well On unwashable fabrics sponge the stain with denatured alcohol diluted with two parts of water A bleach may be necessary

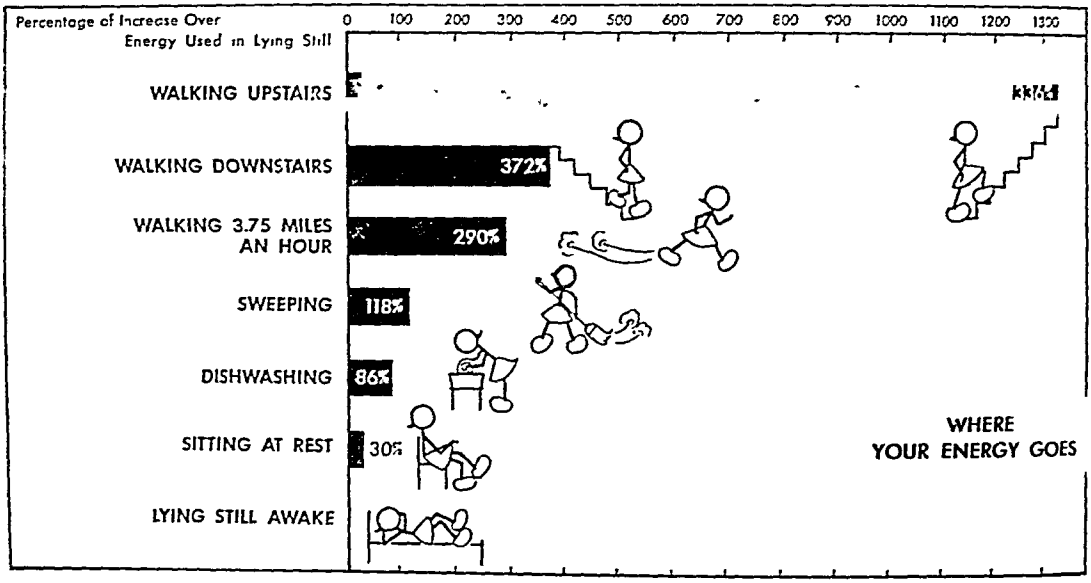
Ink Apply absorbent powder to still wet spots Then if the fabric is washable apply glycerin or soapless shampoo rub lightly and rinse with water It may be necessary to follow with a bleach Some inks wash out with soap and warm water For ink on unwashable fabrics consult a reliable dry cleaner

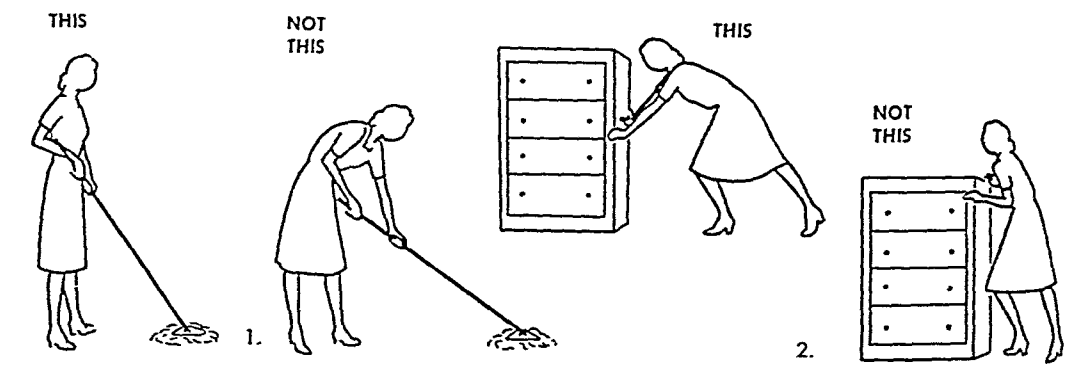
Lipstick Loosen the stain with vaseline Next sponge unwashable fabrics with carbon tetrachloride If color remains sponge with alcohol diluted in two parts of water Laundering will usually remove the loosened stain from washable fabrics

Scorch Washing with soap and water may remove light scorch stains For scorch on white fabrics follow this if necessary by bleaching in the sun Sponge scorch on other fabrics with sodium perborate and hydrogen peroxide as described under Bleaching

Tea Follow the procedure for removing coffee stains

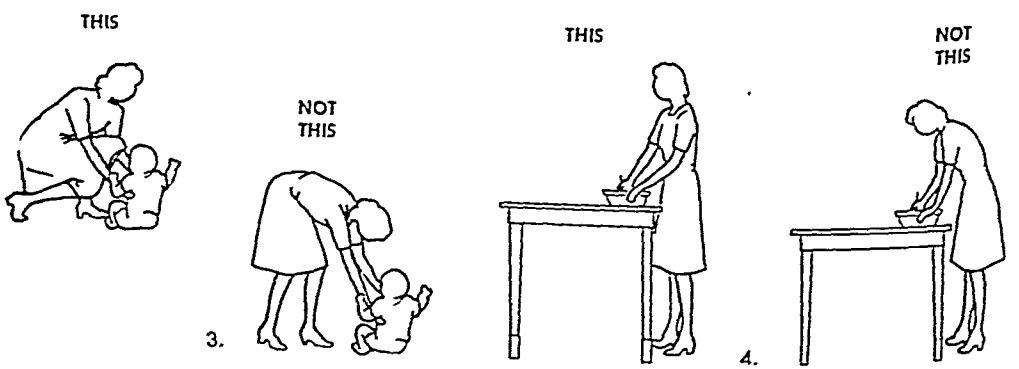
ENERGY IS TOO PRECIOUS TO WASTE





1. Back bending is backbreaking.

2. Use whole body at center of weight to be moved



3. Use leg muscles rather than back muscles.

4. Have working surfaces the right height

As the chart at the top of the page indicates, unnecessary trips upstairs and down are an extravagant waste of energy. Forethought often makes it possible to combine several errands into one trip Unnecessary walking during household tasks also wastes energy. The four sets of sketches below the chart show right ways and wrong ways of using the body. Right ways conserve energy. Chart and sketches are from the United States Department of Agriculture bulletin 'Posture in Housework'

her t me Fatigue decreases the amount and quality of her work and may lead to accidents (*see* Work and Fat gue) Boredom frustration hurry worry or insecurity may cause fatigue as well as hard work Skill and confidence on the other hand tend to eliminate tiring tenseness Boredom arises from the large num ber of repeated tasks in housework and from the fact that it continues over the seven days of the week

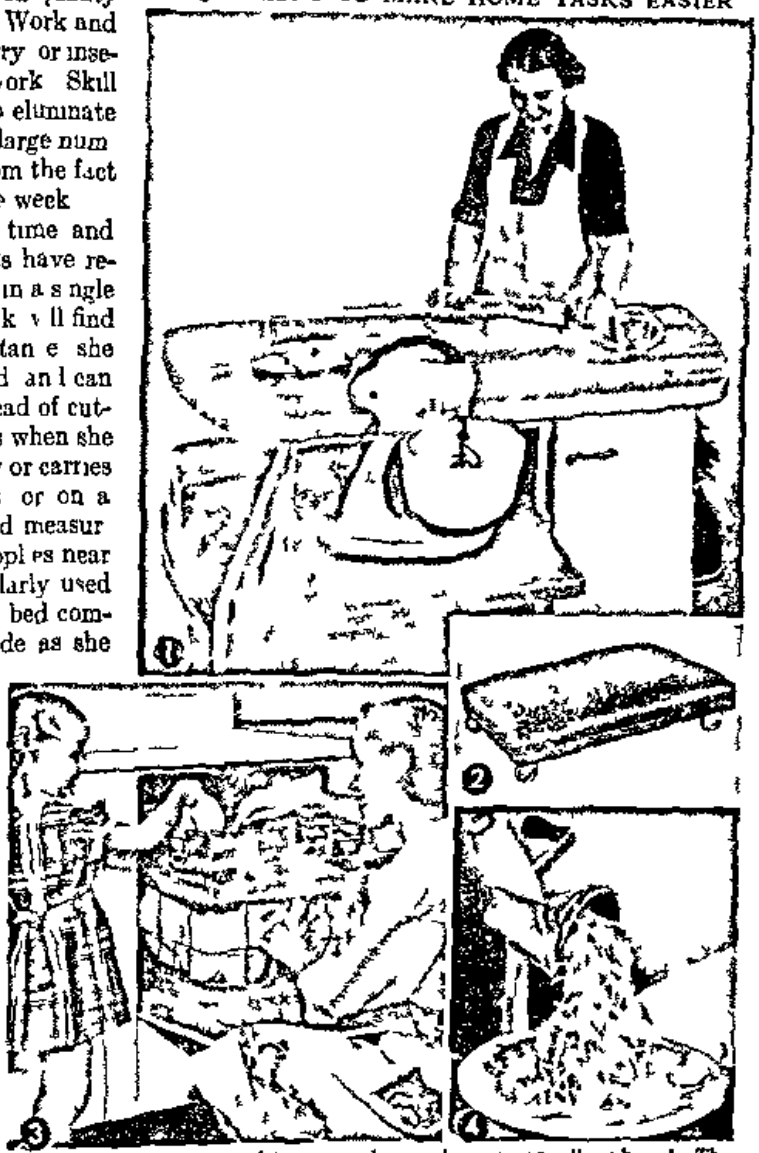
Work simplification methods can save time and energy Motion studies of household tasks have revealed ways to el minate 100 or more steps in a s ngle task The homemaker who studies her work will find *many ways to improve motions* For instan e she can learn to make wider use of the left hand an l can chop a bunch of vegetables on a board instead of cutting a s ngle one in the air She saves steps when she keeps all tools for a task stored conveniently or carries everything needed on a tray in a basket or on a rolling cart or table She stores mixing and measur ng spoons bowls beaters and cooking suppl es near the food preparation area and keeps regularly used dishes near the sink Making one s de of a bed completely instead of walking from side to s de as she spreads each cover also saves steps Energy is conserved by using the larger muscles—ben ling the knee and lifting with the thigh muscles wl en p ck ng up a heavy object from tl e floor or employing the arm mus cles instead of those in the hand and wrist for paring vegetables and similar work

Proper tools and equipment simpl fy work. S nk table and counters should be the proper working height The work space should not be so wide that the homemaker must stretch to reach supplies Wherever possible she should sit at her work

Guiding Other Workers

Good home management calls for ability in guid ng the work of others It is especially important for a mother to develop in her children a *favorable attitude toward* work To keep interested children need a feeling of accomplishment *If* the mother expects perfect results from a beginner a sense of fa lure will make him hate household tasks On the other hand he may enjoy having respons bility for a job he does well Clear d rec tions and an explanation of the purpose and value of a task add to its interest A good home manager uses tact in direct ng and correcting her helpers She works soc ably with them or leaves them to work qu etly accord ng to their preference

EQUIPMENT TO MAKE HOME TASKS EASIER



1 This cab net s hardwood top is used as a chopping or rolling board. The mixer shelf rises from its storage space to proper work leve 2 A rolling knee ng pad makes scrubb ng eas er and can carry small loads 3 The small g rl enjoys be p ng her mother load an automat c dishwasher 4 This cutter s removable cones sl ce chip shoestring and shred vegetables.

REFERENCE-OUTLINE FOR HOME ECONOMICS AND MANAGEMENT

HOME ECONOMICS

I Development of the sc ence of home economics H-409
- A Chang ng l v ng cond t ons and new nvent ons revolut on ze homemaking methods H-409
- B The teach ng of home econom cs H 409

II Food and nutr t on F 210-17 See also the Reference-Outline for Food
- A Food chemistry and important elements in food B-145-7 carbon C-120 hydrogen H-459 oxygen O-435 nitrogen N 210 albumen A 144
- B The essent al elements of food and their func t on F 216-17 B-145-7 H-302 See also in Fact Index Ca bohydrates Fats Minerals Proteins and V tam ns
  1. Carbohydrates C-216 starch S-382 sugar S-443-7
  2. *Fats* F 44-5
  3. Minerals M 267
  4. Proteins P 422 B-147
  5. Vitamins and roughage H-302 V-494-8
  6. *Water* W-60 D-92

C. Food measurement: the calorie C-49, F-217, H-319
D. Digestion D-90-2: enzymes E-389; fermentation F-52; pepsin P-144
E. Cooking C-463-6
1. Bread and baking B-294-8
a. Flour F-165-7: wheat W-115; rye R-300
b. Leavening agents: baking powder B-18; cream of tartar G-156; yeast Y-336
2. Candymaking C-110-12
F. Food preservation F-219-24, A-266, F-214
1. Why foods spoil F-219: bacteria B-14; mildews and molds M-247-8
2. Canning F-219-22
3. Dehydration F-223-4
4. Freezing, cold storage, and refrigeration F-222-3, R-93-6, V-497
G. Pure-food laws P-442-3, F-221
H. How grocery stores and markets obtain food supplies F-211-14
I. Serving of food:
1. Table equipment, picture E-407, chinaware P-393, 398-400; glassware G-119, linens L-254; silverware S-188, K-59, pictures E-408
2 Table etiquette E-405, 409-10

III. Clothing C-353-7, D-148-51. See also the Reference-Outline for Clothing
A. Materials C-354-6: fabrics F-4-9, textiles T-97-100, 102
B. Spinning, weaving, and knitting S-348-52, K-57-9
C. Sewing S-110-15: sewing machine S-115-18

IV Shelter (the house and its equipment) S-144*d*-145, H-430*a*, pictures H-430, 430*b*, 431*a*, 432, 433, A-308. See also the Reference-Outlines for Shelter and Housing, and for Architecture
A. Planning to build a house B-345-346*b*
B. Interior decoration I-176-85
C. Furniture F-317-319*b*, picture F-320
D. Lighting L-238, I-184-5, B-346*b*, pictures L-239
E. Heating and ventilating H-321-6: furnace F-316; stove and fireplace S-424; air conditioning A-77-8
F. Household equipment: brooms and brushes B-330, electric laborsaving devices E-313, V-434. See also table equipment in section II above
G. Fire prevention F-89-91, B-346*b*

HOME MANAGEMENT

I. Gaining family co-operation H-410*a*, 413
II. Improving efficiency H-410*b*
A. Work simplification methods H-413
B. Principles of work and fatigue W-199-200

III. Money management and purchasing H-410, 410*b*, T-125-6

IV. Sanitation H-303-4
A. Water W-63; supply and purification W-71-3; plumbing P-322-3
B. Facts about the air we breathe H-304: air conditioning A-77-8
C. Household pests: ant A-257; bedbug, picture P-79; cockroach C-373; clothes moth I-162; flea F-142; fly F-188; mosquito M-400; mouse M-441; rat R-76
D. Waste disposal S-110
E. Cleaning and cleaning materials: chemical aids to washing L-136; how to remove spots and stains H-411
1. Absorbents: Fuller's earth F-315; talc T-8
2. Bleaches B-205: sulfur dioxide S-448
3. Solvents: alcohol A-145; ammonia A-236; benzene B-124; ether E-400; glycerin G-127; soap S-211
F. Disinfectants A-265-6
G. Importance of refrigeration R-93

V. First aid and home nursing F-94-8, H-410*a*
VI. Safety in the home S-7-8, pictures S-9
A. Fire hazards F-89-91
B. Poisons and antidotes P-340-1, F-96

VII. Budget, or planned spending H-410, T-125-6

FAMILY LIFE AND USE OF LEISURE IN THE HOME

I. The history of marriage M-101*a-b*

II. Development of the family as a social unit F-16-20

III. Family relationships H-410*a*
A. Baby and child care B-2-4, C-239-48
B. Problems of adolescence A-22
C. Development of personality P-159*a-d*. See also the Reference-Outline for Personality and Character Development
1. Emotions and habits E-340, H-240
2. Good manners in the home E-405
3. The art of conversation C-458-61

IV. Using leisure time at home L-158-61
A. Reading for pleasure R-84*f*
1. Growing up with books L-207-217, R-82*d*-84*c*
2. Magazines and newspapers M-29-30, N-190
B. Hobbies H-387-401. See also the Reference-Outline for Vacation Activities
1. Home photography P-211-18
2. Stamp collecting S-363-7
C. Pets and their care P-181-6
1. How to choose and train a dog D-116*d*-117
2. How to stock and keep a home aquarium A-279-80, 280-2
D. Home gardening G-12-19
E. Play P-315-20
F. Games G-8-8*f*. See also the Reference-Outline for Sociology, *subhead* Social Beliefs and Customs
G. Storytelling S-404-23
H. Puppets P-441-2
I. Magic M-37-40
J. Vacation activities V-421-32

Note: See also the Reference-Outlines for Physiology, Health, and Medicine; Psychology; Sociology; and Vocations

BIBLIOGRAPHY FOR HOME ECONOMICS AND MANAGEMENT

Books for Younger Readers

Chapman, J. A. Child's Book of Sewing (Greenberg, 1951).
Freeman, M. B. Fun with Cooking (Random, 1947).
Friend, M. R. and Schultz, Hazel. First Book in Home Economics (Appleton, 1941).
Jordan, N. R. How to Sew (Harcourt, 1941).
Karasz, Mariska. Design and Sew (Lippincott, 1946).
Lowndes. M. S. Manual for Baby Sitters (Little, 1949).
Schneider, Herman. Everyday Machines and How They Work (Whittlesey, 1950).
Schultz, Hazel. The Young Consumer (Appleton, 1945).

Books for Advanced Students and Teachers

Amidon E P and others Good Food and Nutrition for Young People and Their Families (Wiley 1946)
Boulet Zella Home Freezer Book for Better Living (Viking 1950)
Bradbury D E and Amidon E P Learning to Care for Children (Appleton 1946)
Collins W S Complete Book of Home Millinery (Funk 1951)
Cushman E M Management in Homes (Macmillan 1945)
Farmer F M Boston Cooking School Cook Book (Little 1951)
Gilles M D All About Modern Decorating (Harper 1948
Gilles M D How to Keep House (Harper 1949
Gross I H and Crandall E W Home Management in Theory and Practice (Appleton 1947)
Justin M M, and Rust L M O Today s Home Living (Lippincott 1947)
Landis P H Your Marriage and Family Living (McGraw 1946)
New York Herald Tribune Home Institute America s Cook Book (Scribner 1952)
Rathbone Lucy and Tarpley Elizabeth Fabrics and Dress (Houghton 1948)
Rombauer I S and Becker M. R. Joy of Cooking (Bobbs 1951
Spock B M Common Sense Book of Baby and Child Care (Little 1946)
Stapleton Elsie Spending for Happiness (Prentice-Hall 1949
Symons Arthur Woman s Fix It Book (Greenberg 1949)
Talbot Constance Complete Book of Sewing (Greystone 1949)
Tolg M R Homemaking Can Be Easy (Watts 1949)
(*See also* bibliographies for Architecture Etiquette Clothing and Shelter)



HOMER The unknown author (or authors) who wrote the famous Greek epics the Iliad and the Odyssey gave us the greatest poems of their kind Herodotus said that the author was Homer an Asiatic Greek who lived about 850 B C Other ancient Greek historians gave different dates and lands for his birth

Tradition pictures Homer as a blind old man wandering from place to place reciting his poems Many scholars believe that these epics were not composed by a single person and were not written down until centuries after they took their present form It is almost certain they were handed down from memory as there is little evidence that writing was practiced in Greece at so early a period One theory concerning their origin is that they are the work or compilation of a company of poets who composed and collected in this form the legends of the Trojan War The Iliad and the Odyssey are sometimes attributed to different writers and sometimes to early and later periods of Homer s life

The Greek war with Troy forms the basis of the poems The Iliad tells the story of the wrath of Achilles while the Odyssey relates the many adventures of Odysseus (Ulysses) on his voyage home Even though the poems contain only a shadow of historical fact scholars owe a great debt to them for the information they furnish concerning early life in the lands about the Aegean Sea Excavations by Heinrich Schliemann and other archeologists on the site of Troy and elsewhere have confirmed the information from the poems (*see* Aegean Civilization, Schliemann)

One does not need to be a scholar to appreciate the wonderful stories in Homer The person who reads the poems in translation or paraphrase cannot miss the charm of the story or fail to be interested in the heroic characters He can follow them through stirring battle scenes in the Iliad and through many and strange adventures in the Odyssey Only the student of the Greek language can fully appreciate the simple and lofty beauty of the original the directness and vigor of the winged words and the flowing music of the long hexameter lines

The best prose translations are those of the Iliad by Lang Leaf and Myers and the Odyssey by Butcher and Lang One of the best-known translations in verse is that of Pope but his version conveys less of the spirit of Homer The American poet Bryant made a good poetic translation and there are several 20th-century English versions Some of the best-known Homeric tales may be found in this encyclopedia (*See also* Achilles Ajax Amazons Circe Cyclops Hector Odysseus Paris Proteus Trojan War)

HOMER WINSLOW (1836–1910) No one has painted the fury of the sea more vividly than has Winslow Homer This American artist first won fame for his magazine drawings then turned to painting He now ranks as one of the greatest painters of the sea

Homer was born Feb 24 1836 in Boston Mass where his father owned a hardware business Six years later the family moved to nearby Cambridge Winslow loved the country life and spent much time fishing and boating These sports later appeared

WINSLOW HOMER AND THE GULF STREAM



Here Homer pauses before his famous water color The Gulf Stream The picture dramatizes the plight of a Negro adrift in a rudderless boat.

frequently in his paintings. His mother, an amateur artist, encouraged him in drawing.

At 19, Homer was apprenticed to a Boston lithographer. He learned line drawing, and two years later he opened a studio. In 1859 he moved to New York City. There his first big assignment was to sketch Lincoln's inauguration for *Harper's Weekly*. During the Civil War the magazine sent him to Union Army headquarters as an artist-correspondent. His camp scenes won him a wide reputation.

At the height of his success, Homer decided to try painting. He turned some of his army-life sketches into oils. Encouraged by the reception they received he gave up illustrating. His first paintings told a story, usually of some everyday occurrence. Art critics of the time considered them vulgar, but today these story-paintings, although not great art, are regarded as valuable records of 19th-century life.

A trip to England in 1881 marked the beginning of Homer's work as a marine artist. For two years he lived in a little fishing village on the North Sea. On his return to America, he concentrated on scenes of nature. He retired to Prout's Neck, a little resort village on the Maine coast. His studio cottage faced the Atlantic and he painted its foaming waters again and again. He usually spent the winter months in Florida or the Bahamas, making water colors of the dark-skinned inhabitants. Homer never married. He died at Prout's Neck on Sept. 29, 1910.

Homer was a self-taught artist whose technique evolved slowly. It was largely naturalistic, but the luminous, intense water colors he produced in his later years suggested impressionism.

HONDURAS. Nine tenths of Honduras is such a jumble of mountains, hills, and steep-sided valleys that a Honduran statesman once made a crumpled sheet of paper serve as a relief map of his country. The rugged land has hindered the development of this Central American republic. The capital, Tegucigalpa, is one of the few capital cities of the world without railway connections. Road building is so difficult and expensive that work on a network of all-weather roads was begun only during the second World War. A narrow strip of level coastal plain and valley along the Caribbean Sea coast produces its chief source of trade and wealth—bananas.

Honduras, roughly triangular in shape, spreads across a shoulder of Central America jutting into the Caribbean south of the Yucatán Peninsula. Its north coast line extends about 350 miles, while its narrow Pacific coast on the Gulf of Fonseca is only 50 miles wide. Guatemala lies to the west, El Salvador to the southwest, and Nicaragua to the south and east. The republic is separated from the colony of British Honduras by the Gulf of Honduras (*see* Central America; Yucatán).

The country's area is estimated at 59,161 square miles. The main Central American cordillera crosses it from west to east, sending spurs northeastward toward the Caribbean. The highest peaks, towering to 10,000 feet, rise in the southwest near Lake Yojoa, the largest lake. The chief rivers rise in the mountains and drain through narrow valleys toward the north coast lowland. The Ulua has the largest volume of water and drains the best agricultural area of the country. The longest river, the Patuca, flows through an unexplored and undeveloped region, the Mosquitia, in the northeast. It is believed to be rich in hardwoods, gold, and fertile land, but it is still a wilderness, populated only by scattered tribes of Indians. The Bay Islands (Islas de la Bahia) in the Caribbean belong to Honduras.

Tropical Climate and Seasonal Rains

Honduras lies within the tropics and the trade wind belt. The lowlands are hot and humid, but temperatures fall with elevation, and the highlands are springlike and pleasant. Tegucigalpa, at 3,200 feet, has an average temperature of 72° F., a maximum of 98° F., and a minimum of about 46° F. The rainy season lasts from May until November. Slopes facing the moist east winds get the heaviest rainfall, and valleys sheltered from these winds are dry.

Tropical rain forests grow on the steaming north coast. The mahogany, primavera, guayacan, and other valuable hardwoods have been cut near settlements, but good stands remain in remote valleys. At higher altitudes, pines are the principal trees. The densest woods are the "cloud forests" growing above 5,500 feet on windward slopes. Here clouds carried by the trade winds have been forced upward until they drop their moisture as rain and mist.

How the People Live

Honduras, with a population of 1,505,465 (1950 census), is rather thinly settled. About 90 per cent of the people are *mestizos*, of mixed Spanish and Indian blood. Most of them are farmers in the upland valleys. The people avoided the lowlands until the 20th century, for they were unhealthful as well as hot. Only after fruit companies from the United States cleared and drained the land for banana plantations, eradicated disease-carrying mosquitoes, and supplied safe water and other utilities was the region settled.

About 6 per cent are pure Indians, who dwell mainly in the mountains bordering Guatemala. They live much as their Mayan ancestors did, cultivating hillside corn patches, called *milpas* (*see* Mayas). At Copán, site of an ancient Mayan city, ruins of stone monuments, altars, a ball court, and other structures have been found and partially restored. About 2 per cent are Negroes. Most of them work on north coast plantations. Only a little over one per cent are whites, mainly concentrated in the mining districts and in the north coast towns and plantations.

Honduras has a liberal land policy and it is not hard for a man to get an upland farm. He can rent or buy land cheaply from the government or become an owner by "homesteading" or clearing and improving virgin land. Lumber for a house is plentiful too.

Most farmers raise crops and stock for their own use because market roads are scarce. They grow corn, beans, squash, wheat, and potatoes. In favorable areas, coffee, small-leaf tobacco, and abaca may

A LOWLAND PLANTATION AND THE CAPITAL CITY OF HONDURAS



A North American fruit company bu lt th s extensive banana p antation on the coastal p ain Notice the ra n forest growth beyond the banana rows and the raincIouds nearing the h lls



Here the steep streets and Spanish style houses of Tegucigalpa the cap tal r se above its 18th century cathedral Parque Morazan before it honors the patriot Gen Franc sco Morazán

be grown as cash crops and hauled to a market town in an oxcart over rutted roads or tra ls

Highland Industry and Transportation

The uplands are poorly develoj ed industrially Gold and s lver mining began under the Spanish con qu stadors Other mineral resources include lead cop per z nc iron and antimony but they have been l ttle worked The chief gold and silver m nes are near Tegucigalpa Highways south to San Lorenzo w th its island port Amapala and northwest to Potrerillos term nus of the National Railroad now permit truck ing of ores that once moved by pack mule Other up land all weather roads are under construction and a 95-mile link of the Pan American Highway crosses narrow southern Honduras Airplane lines are widely used within the country and to other lands

Lumbering of the p ne forests has increased with improved roads A few factories make soap matches flour cloth beverages and other products in every day use Tegucigalpa (72 385) includ ng Comaya guela across the Choluteca River is the main city

Development of the North Coast

The development of the north coast lowland is based on the banana industry Here the country s only railroads are used mainly to haul bananas On the coast are the chief ports where bananas the lead ing export are shipped A large proportion of the people work for the fruit companies whose villages have schools stores hospitals and other modern facilit es. Independent lowland farmers also raise bananas together with such other tropical crops as sugar cane coconuts and cotton

The busy ports are Puerto Cortés (12 228) La Ceiba (16 645) and Tela (12 614) The factories on the lowlands are located in the port cities and in San Pedro Sula (21 139) the ch ef d str but ng center

Education and Government

Educat on is free an l compulsory in Honduras but only about half of the children of school age attend a sch ool because there are few in the rural distr cts The National Univers ty is in Tegucigalpa and there are several normal schools A school of agriculture supported by a fru t company offers scholarships to students from the various Latin Amer can nat ons

Honduras s a republ c Its president vice-pres ident and members of the Congress of Deputies are popularly elected Only men have the vote Judges and governors of departments are appointed

History of the Republic

Chr stopher Columbus d scovered the Honduran coast on h s last voyage an l landed there Aug 14 1502 After Cortez pushed down from Guatemala in 1524 the Spaniards explo ted the precious metals they found Dur ng the 16th and 17th centuries the coast was often attacked by French British and Dutch buccaneers The Captaincy General of Guatemala which included Honduras declared its independence from Spain in 1821 The area first became part of Mexico then shared in forming the United Provinces of Central Amer ca On Nov 5 1838 Honduras be came independent Over the years it has had its share of revolution and d ctatorsh p but it has made prog ress toward economic and political stability (*See also Latin Amer ca* Latin American Literature)

HONEYSUCKLE. The fragrant flowers and colorful berries of this favorite ornamental shrub and vine are attractive to bees and birds. Many of the honeysuckles are climbers. Some are tall, hardy bushes; others are trailers. The trailers form good ground cover, but the wild species are such sturdy growers that they may become pests.

FRAGRANT VINE



Japanese honeysuckle (*Lonicera japonica*) is a climbing vine with white or purplish blossoms and black fruit.

The trumpet honeysuckle is a popular climber. It has orange-scarlet flowers with yellow centers, and red fruit. Hall's honeysuckle, with white or purplish flowers and orange-red fruit, makes a beautiful cover for fences. The tartarian honeysuckle, the most common bush species, reaches a height of ten feet. In May and June it is covered with rose-pink blossoms, and in the fall with bright-red berries. Morrow's honeysuckle and the fragrant honeysuckle are somewhat smaller bushes. Each one has white flowers. The Japanese honeysuckle is native to East Asia. (For illustration in color, *see* Flowers.) Among the many wild species which bloom in early summer are the fly and the smooth-leaf honeysuckles.

About 175 species of honeysuckle are found throughout the northern hemisphere. Nearly 100 species and many varieties and hybrids are cultivated. The honeysuckle family (*Caprifoliaceae*) includes the true honeysuckles (*Lonicera*), the bush honeysuckles (*Diervilla*), as well as elders, viburnums, and weigelas. Scientific name of trumpet honeysuckle, *Lonicera sempervirens;* tartarian honeysuckle, *L. tatarica;* fly honeysuckle, *L. canadensis;* smooth-leaf honeysuckle, *L. dioica;* Hall's honeysuckle, *L. halliana;* Morrow's honeysuckle, *L. morrowii;* fragrant honeysuckle, *L. fragrantissima.*

HONG KONG. When England in 1841 obtained the mountainous little island of Hong Kong from China, it was a barren haunt of pirates. But its situation had immense commercial and military value. Lying at the mouth of the Chukiang or Pearl River, 75 miles from Canton, it became the chief port of southern China and a main outpost of British defense in the Far East. In its superb sheltered harbor of ten square miles, liners and freighters from every corner of the world anchored beside junks, sampans, proas, and other strange craft of the Orient.

The city which became the center of this thriving commerce is Victoria, on the northwest corner of the island. Built by the British, it is the most European city of the Orient. It is built on terraces up the steep slope of Victoria Peak (1,825 feet). At the foot along the water front is the business district, with massive buildings that remind one of London. Here too is the huge crowded Chinese quarter, noisy with sidewalk peddlers and beggars. Stairlike streets lead up the rocky slope. On the upper levels of the mountain, reached by cable cars, motors, rickshaws, and sedan chairs, is the residence section.

On the mainland of China, less than a mile away across the channel leading to the harbor, is the city of Kowloon, where the largest liners dock (for picture *see* Harbors and Docks). Ferries connect the sister cities. A government railway links Kowloon with Canton and other cities of China. There is air service to all parts of the world.

The Colony of Hong Kong includes several small islands as well as the main island and the Kowloon Peninsula. It is supported chiefly by foreign trade. The principal businesses are banking, brokerage, insurance, and similar activities arising from its trade. In addition to building and repairing ships, it prepares sugar and tea, and has small manufactures of such articles as cement, paper, glass, furniture, textiles, and tobacco, chiefly from imported materials. Aside from its fisheries, it is almost wholly dependent on imported foodstuffs. There is a university, with schools of arts, engineering, and medicine.

Hong Kong Island is about 11 miles long and from 2 to 5 miles wide, with an area of 32 square miles.

IN HONG KONG'S CHINESE QUARTER



Rickshaws and sedan chairs are the only vehicles that can travel the steep, narrow streets of the Chinese quarter. The street shown here is wide and modern compared with the narrow lanes that make up most of this section.

It was ceded to Great Britain after its capture during the Opium War with China (1839–42) In 1860 China ceded the Kowloon Peninsula, and in 1898 leased an adjacent area, the "New Territories" to England for 99 years The entire colony has an area of about 390 square miles and a population of 2 250 000 (1953 est) About 98 per cent are Chinese

In the second World War it was the first British possession to fall to Japan Dec 25 1941 The Japanese treated the residents savagely Allied air raids damaged the city before Japan surrendered it in 1945

HOOKWORM The "lazy disease" common in the warm regions of the world including the rural districts of southern United States is caused by the parasitic hookworm It lives in large numbers in the intestinal tract, where it saps its host's vitality, stunts growth retards mental development, and may even cause death The larvae develop in soil polluted by the intestinal waste of hookworm victims They usually enter the body through the skin of the bare feet, passing in the bloodstream to the heart and lungs, and eventually to the intestines The parasites are readily destroyed by certain drugs and the wearing of shoes will prevent further infection Eradication of the hookworm however requires the cooperation of entire communities in sanitation and personal hygiene Hookworms belong to the genera *Necator* and *Ankylostoma*, of the class *Nematoda*, or round worms

The 31*st* PRESIDENT *of the* UNITED STATES

HOOVER, HERBERT CLARK (born 1874) Probably no man in public life during the first World War and the years immediately after it has been the subject of more legend and story than Herbert Hoover The name of this reticent Quaker was known to few outside his own profession in 1914, but four years later it was famous the world over



HERBERT HOOVER

The influence of heredity and his boyhood environment are strongly marked in Hoover's character. The Hoover family for at least six generations were Quakers, of Swiss origin, tradition says The first American Hoover was Andrew, who owned a farm in Maryland about 1740 The Hoover family followed the American frontier westward until finally they reached Iowa and with other Quakers founded the town of West Branch Here Jesse Hoover, Herbert's father, abandoned farming and became the village blacksmith Herbert, one of three children, was born at West Branch on Aug 10, 1874

The summer after his father's death, when he was six years old, Herbert visited his Uncle Laban who was government agent for the Osage nation in the Indian Territory He learned from the Indians a woodcraft that any Boy Scout might envy Years later he would relax from the strain of official life by going into the woods for a day's camping building his fire Indian fashion, and doing his own cooking

Herbert's mother, Huldah Hoover, an intelligent, efficient woman, better educated than most women in her community, died when he was nine He lived with an uncle, Allan Hoover, on a farm in Cedar County, Iowa, for two years and then was sent to Newberg Ore, where his mother's brother Dr John Minthorn had founded a Quaker community and opened an academy When Herbert was 14 and ready for high school, his uncle moved to Salem, Ore, and took the boy with him to act as bookkeeper and office boy

Inspired by a conversation with an engineer about mining and about the new Leland Stanford Junior University, Hoover determined to become a mining engineer and entered the university in 1891 In college he did well in mathematics and the sciences To pay his expenses he at various times delivered newspapers served a laundry route, did clerical work and was secretary to Prof John C Branner, head of the department of geology Each summer he did surveying Out of his hard won leisure he gave considerable time to student activities The present student constitution was largely his work, and he himself was the first treasurer of the student body

Career as an Engineer

Leaving Stanford in 1895 with a sound theoretical training Hoover went to Nevada City to get some practical experience His first job was pounding a drill, shoveling ore, and pushing a hand car for $2 50 a day Soon he had a real job as assistant to the superintendent of properties in New Mexico and Arizona, and just before he was 24 came his first great chance Through his employer he was offered the task of introducing American mining methods into the newly opened Coolgardie gold fields in Western Australia

Thus began a career as mining engineer which in the

next 15 years took Hoover to the far corners of the earth. He returned from Australia in two years to marry Miss Lou Henry, whom he had known at Stanford; and left with his bride on their wedding day for China, to organize a national department of mines and railways. His explorations proved that northeastern China has the world's greatest coal deposits During the Boxer Rebellion, which ended this work, he and Mrs. Hoover were among the 200 foreigners who were besieged in Tientsin. In 1901, while conditions were still greatly disturbed, Hoover for a few months ran a large coal mine near Tientsin for its foreign owners.

For the next 12 years Hoover spent gradually more and more time each year in the United States. As his company grew and became better known, he and his associates realized that it was a waste for him to work solely as a technical expert, and he became a reorganizer of "sick companies."

Technical Achievements

Hoover's technical achievements in the period were many. In Australia he and his brother Theodore worked out a new process of recovering zinc from the refuse dumps of the lead and silver mines. In the wild, rugged Altai Mountains of southern Siberia, he had a problem in pioneering, building roads and railroads, assembling machinery, and arranging finances before vast stores of metals, especially zinc, could be opened. In Burma he attacked a mixed deposit of base and precious metals requiring new methods both in chemistry and in engineering. In his scanty leisure time, he wrote the textbook 'Principles of Mining', long a standard in the colleges. Wherever he went, politics was mixed with engineering; so, when suddenly he was faced with a world-wide responsibility, he was no stranger to premiers, foreign ministers, ambassadors, and their various ways.

When the first World War broke out in 1914, Hoover was in Europe procuring exhibits for the Panama-Pacific Exposition. At the request of Walter Hines Page, United States ambassador in London, he undertook to help some 200,000 American tourists, most of whom were left without funds, to return home. His organization cashed checks, made steamship reservations, and raised the funds for those who had no money. By the end of September the job was done.

Then, when Hoover was about to sail for the United States, he was persuaded to undertake the task of Belgian relief. The German armies were using Belgium as a base against France, and the little country, held in the grip of a blockade, seemed doomed to starvation. Hoover promptly severed all his business connections, lest they interfere with the work before him. His many interests at that time promised to make him one of the world's richest men, but he turned them all over to his associates.

Head of the Belgian Relief Commission

There were 10 million noncombatants in Belgium and northern France to be fed. After overcoming the objections of both the Germans and the Allies each of whom saw an advantage for the other side in the plan, Hoover organized the Commission for Relief in Belgium. He sought and obtained funds for this gigantic task from charitable people everywhere and from the governments of France, England and the United States. In his work he went from London to Paris, to Brussels, to Berlin, from Allied headquarters to German headquarters. He possessed information about each combatant which would have been priceless to the other. He was a trained engineer, a practised observer of such matters as terrain, roads, and excavations. Yet never once did he let slip any information which could aid one side against the other.

After the United States broke with Germany, Hoover turned the work over to the Dutch and Spanish. By the end of the war, the Commission had sent a total of five million tons of food and clothing to occupied Belgium and France. Hoover drew no salary and, like many other workers during the war, paid all his own expenses.

United States Food Administrator

When the United States went into the conflict, in 1917, Hoover was made food administrator. The law creating the Food Administration was drafted with his help. It was his task to see that the country produced and saved enough food to supply its allies in the war. About 14 million families pledged themselves to his programs. His name was a household word; to "hooverize" meant to save, to substitute, to practise self-denial and help win the war.

When the war ended, Hoover saved the American farmer from financial ruin by persuading the Allies to buy some of his surplus food. As head of the Supreme Economic Council, established by the Peace Conference, Hoover directed the distribution of food to the starving peoples of Europe. His organization of American businessmen and engineers from the army reserves not only saw that food reached the starving

HERBERT HOOVER'S ADMINISTRATION 1929–1933

Federal Farm Board created (1929).
Federal Radio Commission (1929).
Financial Crisis and Beginning of Depression (1929).
Naval Treaty of London (1930).
Claims against Germany reduced (1930).
Hawley-Smoot Tariff Act (1930).
Department of Justice takes over Prohibition Enforcement (1930).
Veterans' Administration formed (1930).
Federal Power Commission strengthened (1930).
Tariff Commission reorganized (1930).
Soldiers' Bonus Bill (1931).
Wickersham Commission *report* (1931).
German and Interallied Moratorium (1931).
Federal Unemployment Commission (1931).
Reconstruction Finance Corporation and Other Relief Measures (1932).
Great Lakes-St. Lawrence Seaway Treaty with Canada Negotiated
20th Amendment Adopted (1933).

nat ons but helped to open traffic on railroads became fuel administrators fought typhus epidemics and started the wheels of commerce which had been idle

Finally after the peace Congress appropriated mil lions to feed Europe s undernourished children but st pulated that no money should be spent in former enemy countries Then Hoover sent for the leaders of his own people the Quakers and persuaded them to assume the task of feeding the German children

In 1921 Pre dent Harding appointed Hoover secretary of commerce In seven busy years Hoover made his department one of the most effic ent governmental *organizat ons in the world* He established n the Bureau of Standards a new division of simplified practise which has saved American manufacturers m ll ons of dollars a year He had long foreseen the need of government control of rad o and he himself worked out the main princ ples which Congress followed in controlling rad o broadcasting For civil aviat on he worked out a program of government support with l ghted air routes landing fields and charts and placed the work under a new division of aviat on

Election to Presidency

Among the possible successors of Pres dent Cool idge the name of Hoover met with most favor He had been mentioned as a poss bility in 1900 but he had then been too slightly ident fied with either political party to be available He had now behind him seven years of service in a Republican cabinet and a better training in successful priva e life and useful public life than any new presidential nominee since Washington He was named on the first ballot at Kansas City with Charles Curtis for vice-pres dent

The Democratic Party made an issue of the scandals that had marred the presidency of Harding They nominated *Gov Alfred Emanuel (Al) Smith* of New York an avowed wet a Roman Catholic and a man so able that the Republican Party was forced to present a first-rate candidate The Republ cans promised to maintain prosperity to assist the farmer and to make a better attempt to enforce the dry amendment and law in general The South largely Protestant and dry turned against Smith, so that he carried only six states of the lower South he won but two elsewhere Massachusetts and Rhode Island Some three of every five votes cast went to Hoover giving him the most smashing victory up to that time

Foreign Policy

Before organizing his new administration in 1929 President-elect Hoover indicated that his would be a friendly foreign policy Traveling on the battleship *Maryland*, he visited the Latin American countries continuing the good work done by Pres dent Coolidge at the Pan American Conference in Havana in 1928 As President in 1930 he arranged a conference on the limitation of armaments in London he sent a delegation to a League of Nations disarmament conference in 1932 he urged American partic pation in the World Court. And in 1931 he persuaded the European na tions to join the United States in a general moratorium by which payments on the r debts to each other should be deferred for a year in the hope of advancing general prosper ty But in sp te of good will *the world* advanced little toward peace Europe remained upset in its business and pol tics while in Asia, Japan separated Manchukuo from China in 1931 in spite of the pledges that had been recorded in the *Kellogg Pact.*

Economic and Pol tical Progress

Alone among the nations the United States rode on the crest of a wave of prosperity which had been mount ng stead ly since 1921 There was money to spend and money was spent The national debt was *reduced without increasing taxes* Cit es *were rebu lt* with new stores and office buildings and new homes Automobiles became more numerous and rad o sets found buyers in nearly every family Conveniences in the home and labor-saving machinery in the factory were mult plying The Ohio River channel was deepened and construction was begun on the great Colorado Riv er improvement at Hoover Dam The cap tal city Washington was yearly increasing in magnifi cence Before he left office Hoover laid the corner stone of a much needed National Archives Building

Progress was made in public affairs The national budget system set up during the Harding administrat on improved the management of publ c money matters The Veterans Bureau and the Pension Office were reorganized and merged As might have been ex pected from his previous record the Pres dent worked continually to improve the working efficiency of the government Besides lending his support to a study of the organ zation of all government offices he appointed commis sions to survey social and economic trends in the United States to study law ob ervance and en forcement (the W ckersham Commission) and for many other purposes And he held conferences of bus ness and profe sional leaders on matters pertaining to the public welfare such as the White House Confer ence on Child Health and Protect on

Congress reapportioned its members among the states in 1929 and the 20th Amendment to the Con *stitut on* was proposed and later ratified This elim inated the interval when lame ducks remained in off ce after their successors had been elected (*see* Con gress) It advanced the date for the meeting of a new Congress to January 3 following the elect on and the date for the inauguration of the pres dent to January 20 *Still another amendment, the 21st to repeal the* 18th (dry) Amendment was sent out to the states as Hoover left office The willingness to try to enforce prohibition which had prevailed in 1928 had given way to a desire to get rid of it

Difficulties of the Farmers

But the general prosperity spectacular and intox icating as it was was not sound The farmer c t zens let down from the crest of h gh prices for their produce and high land values prevailing in the first World War lagged behind the rest of the country W th improved machinery the farmer could raise more food with fewer hands each year But he could not sell it at a profit

Europe was too poor to pay for American food unless Americans lent the money with which to buy it; and the American market could not absorb the total production at normal prices. Prices kept falling. Farmers could not pay off their debts, and banks and insurance companies that had lent money on farm mortgages could not collect what was due them. After the war the farm interests organized to press their demand for relief. New political parties were started, but more generally the farmers demanded, through the existing parties, that the government pass laws to keep the surplus food and cotton, unsalable abroad, from being dumped back into the home market to break the price. Congress was not able to agree upon the terms of such laws; nor were the farmers themselves in agreement upon the sort of law they wanted. But they asserted that Congress had long protected the manufacturer by a tariff on imports, and asked equal consideration for their own interest and safety. And it was certain that unless safety could be brought back to the farm, the welfare of the whole country would be in danger.

In the campaign of 1928 Hoover had promised that immediately after his election he would call upon Congress to pass a farm act, and to revise the tariff schedules so as to protect the farmer. In June 1929 an Agricultural Marketing Act received his signature. He did not believe that commodity prices, which depend on the balance between supply and demand, can be fixed by law, but approved the creation of a Federal Farm Board to help move the crop and to try to keep the surplus off the market. Congress allowed $500,000,000 for this effort. But in spite of all the Farm Board could do, the price of farm products kept on falling. The farmer was left dissatisfied; and before the year was out, calamity struck the whole United States.

Conditions Leading to the Depression

Little is really known about the cause or cure of panics. At rather regular intervals for more than a century the United States has suffered from a collapse of business, followed by unemployment and spread of poverty. In every case, several years of deep depression and stagnation followed a crisis. And in every case the people climbed slowly back into prosperity without quite knowing why. Every collapse was preceded by years of extravagant earnings, during which, after provision was made for food, clothing, and housing, there was plenty of money left for enjoyment or for waste or for permanent investment. Civilization keeps going on the capital that is saved from day to day, to be used for future benefit. If this surplus of wealth is consumed in extravagance, wasted in war, fire, or calamity, or even invested unwisely, the margin that separates comfort from poverty is narrowed. The United States in 1921–29 produced heavily, piling up a huge annual surplus above the costs of immediate maintenance. But personal extravagance wasted much of this. The cost of the war had to be met from it. It financed Europe in the war and after, and Europe could not repay. Much of it was sunk in unwise investments. And when Europe stopped buying, income dropped; and the revenues out of which both maintenance and the surplus must be cared for, fell away.

At the same time, the nation ignored danger from the constant replacement of man by machinery. Every new labor-saving device lessened the demand for labor If there had been no other cause for unemployment, the lack of jobs following "technological change" would alone have created a huge burden upon American society. The cutting off of most of the immigration from Europe by laws in 1921 and 1924 reduced the number of workers, but there were still more workers than jobs. Wage-earners crowded from their positions must be reëducated and cared for until they get new jobs; and children growing up must find work or become a menace to themselves and to society.

But through the years of "Coolidge prosperity," which was expected to continue through the Hoover administration, little regard was paid to the threats against the future. There was a minor panic in 1921, causing Hoover, then secretary of commerce, to warn business that "if the future is like the past, such periods will recur." But few people realized that the United States was heading into another of the troughs between two booms. The financial reserves were being drawn upon more heavily than they could bear, yet business remained optimistic.

Panic broke out in October 1929. Business had been conscious during the summer of a falling-off of buyers Automobile sales had declined, but advertising was relied on to bring the buyers back. Within a few days after the stock market had reached the highest level known, there was a complete slump.

The effect of the collapse of the boom spread rapidly to every level of society. The promotion of new business ceased. People with debts to pay could not raise the necessary amounts by selling their securities. Fear followed hope; and because of fear those who still had cash refrained from spending it. Buying stopped and dealers could not move their goods, retain their help, or pay their bills. Factories, unable to collect their debts or make new sales, laid off more hands. The unemployed lived as best they could on their savings, borrowed on their insurance, sought in vain for jobs, and felt the fear of charity. And upon the farmer, who is the ultimate producer, who was already badly enough off when the rest of the country was prosperous, fell still more burdens.

For the next three years American life went from bad to worse. The bottom of the trough had not been reached when the Hoover administration approached its end in the summer of 1932. It was now known that, in addition to the necessary consequences of depression, business was suffering also from the wild speculation and the misuse of other people's money of which some industrialists had been guilty during the boom

Every administration in office during a panic is held accountable for the suffering, and Hoover was blamed for this misfortune. Burdened to devise untried means to bring about recovery, he had to face defections among his political friends and active hostility from

his political enemies He was not a professional politician and was never much liked by those who were As a successful engineer he knew how to chart a course upon its merits But every politician knows that government cannot do even right and obvious things unless the voters will sustain it

A business man Hoover was not over popular with big business for he believed that it ought to be governed in the public interest and it prefers to be left alone A somewhat diffident man he was not completely at ease in public and lacked the magnetic power to charm and to persuade that a president needs as he explains to the people the measures he advocates He could not escape the depression and its consequences and he was handicapped in two ways No American government had ever relieved a panic or known how to and no one in 1929 could imagine the depths that would be reached in 1932

A DISARMAMENT CONFERENCE PROMOTED BY HOOVER



King George V is addressing the delegates at the opening session of the London Conference on Naval Armament (1930 The King's speech was broadcast through a world wide network of stations The American delegation is at the extreme left facing right

Relief Measures

Hoover called the key men of business to Washington at once urging them not to lay off hands or cut wages He begged the states to create jobs by starting public works He encouraged the leaders of local community chests The states had relieved their own suffering in the past and he believed it would be unAmerican for the Federal government to do it now But when severe drought came in 1930 he approved an appropriation and a relief commission to help the people on the burned-out farms The Congress had no clearer view of the future than the President had It lagged behind him and even deserted him to pass the Hawley-Smoot Tariff This was attacked as forgetting the farmer for the sake of the manufacturer

Dismay at the depression turned into criticism of the Republican Party for doing so little about it In the November elections of 1930 Democrats captured the House of Representatives for the first time in 14 years so that during the last half of his administration Hoover had to face a divided Congress

Before the new Congress assembled in December 1931 a world economic collapse was in sight Germany and Austria were bankrupt To retard the decline and avert possible collapse Hoover in June persuaded Europe to assent to a one-year moratorium But in spite of this England was forced to suspend gold payments in September and much American gold was drawn out of banks to be hoarded by nervous owners

Local government treasuries were nearly empty from the drain caused by relief expenditures and from falling tax collections Private charitable agencies were overburdened Private savings were giving out throwing more persons on relief And the new Congress faced both the need for emergency laws and the temptation to play politics with the approaching election of 1932 in view

Hoover still opposed appropriations for direct federal relief but he approved increased expenditures for public improvements At his urging Congress created a Reconstruction Finance Corporation to lend money to banks insurance companies and railroads so that they might not fail Before the administration ended more than two billion dollars was advanced to such companies Loans to them safeguarded the savings and investments of millions of citizens but brought the charge that the government was too friendly to big business The Emergency Relief Act of 1932 permitted Federal Reserve Banks to lend somewhat more generously for the same purpose It also provided for RFC loans to states for use in direct relief Home Loan Banks were established in 1932 to lend money to persons who were in danger of losing their homes through the foreclosure of mortgages

But while Hoover urged upon Congress more relief laws than it would pass he urged fewer than many leaders demanded The pressure of poverty made him enemies and his stand on certain measures such as the Soldiers Bonus Bill had already made him unpopular with various large groups This bill which raised the maximum loans on veterans 20-year insurance certificates from 22½ per cent to 50 per cent of the face value was passed over the President's veto In 1932 the President further incurred the resent-

ment of many veterans by ordering from Washington the "bonus army" who had come there to demand immediate payment of the bonus.

Meanwhile there were more huge failures, some of them scandalous, involving banks and utility companies. In the agricultural West a Farm Holiday Association was launched to withhold food from the cities until prices rose.

Defeat in 1932

With the depression at its darkest, the presidential election got under way. Hoover and Curtis were renominated, without enthusiasm. The Democrats selected the governor of New York, Franklin Delano Roosevelt, with John N. Garner of Texas, Speaker of the House, as vice-president (*see* Roosevelt, Franklin D.). Hoover was crushingly defeated.

The lame duck session of Congress, 1932–33, was dismal. On December 15, the day for payment of European war debts to the United States, several nations refused to pay. At home frightened bank depositors tried to withdraw their money in gold. Gold hoarding drained large sums from the Treasury of the United States. Many banks closed, and states declared bank "holidays" to save the rest.

Aid was sought from the Federal government, but Hoover could do little. His party was split. The Democratic House preferred to put off remedial legislation until Roosevelt should be inaugurated. And Hoover, although he tried, could not find a basis on which the President-elect would coöperate with him.

No administration had begun more happily than his in 1929; none ended in such despair. Retiring to his home in Palo Alto, Calif., on the campus of Leland Stanford, Jr. University, Hoover kept his silence for two years. Then his frequent criticism of New Deal measures again brought him recognition as a force in the Republican party. In 1940 he won some votes for nomination as president. But his chief role was that of "elder statesman" and adviser. Also in 1940 the Hoover Library on War, Revolution, and Peace was built at Stanford. This Library housed Hoover's invaluable historical records of the first World War.

During the second World War Hoover again worked as a humanitarian. Poland and Finland named him director of American relief efforts on their behalf. After the war in 1946, as honorary chairman of the Famine Emergency Committee he flew to Europe, Asia, and South America to survey food needs and supplies. In 1947 he was appointed by President Truman to investigate food requirements in Germany.

In 1948–49 President Truman placed him at the head of a commission to recommend changes that would promote the efficiency and economy of federal agencies. After the Republicans returned to office in 1953, President Eisenhower appointed him chairman of a commission on organization of the executive branch of the government.

HOPS. When the green conelike blossom clusters of the hop vine take on a yellow tinge and rustle like paper flowers, the hop grower rushes his pickers into the field. The value of his harvest depends on gathering this flower-fruit in the nick of time. The yellowish aromatic resinous substance called "lupulin," which is contained in the fruit, deteriorates rapidly, and it is this substance which gives hops their medicinal and industrial value.

The hop vine is a perennial climber. Each year it produces several twisting stems that reach a length of 15 to 20 feet. The vines do not grow horizontally but cling to upright poles or wire. Hop vines always twist in a right-handed spiral.

There are male and female plants, but the best hops come from fields where only female plants are grown. This prevents seed production, which would detract from the value of the fruit. Plants grown from seed are not true to type; therefore hops must be propagated by root cuttings or by sets.

The principal use of hops is in making beer and other malt beverages. Bohemia is noted for the excellence of its hops. The British Isles and Germany are large producers. Most of the United States crop is grown in the Pacific coast states.

The hop belongs to the nettle family. Its leaves, with 3 to 7 lobes are heart shaped. The flowers grow in panicles. The scientific name is *Humulus lupulus.*

HORMONES. Now and then nature seems to make a mistake and a boy or girl grows so far beyond average size as to become a "giant." A boy may pass the 8-foot mark before he is 18 and weigh close to 400 pounds. Most of us have seen such people in circus side shows as "freaks." But they are not freaks. They are human beings, otherwise normal, whose pituitary gland has been working too energetically.

The pituitary is one of the ductless glands. These glands take material from blood and lymph and make chemical compounds that have an important effect on growth and other functions. The compounds are called *hormones,* from the Greek verb *hormaein,* meaning "to set in motion."

Ductless glands have no openings, or ducts, through which to send out hormones to other parts of the body. But they contain many tiny blood and lymph vessels The glands obtain material for making hormones through the thin walls of these vessels, and send back the manufactured hormones into the blood stream and the lymphatic circulation (*see* Blood). The blood and the lymph then carry the hormones to the organs upon which they act.

When a gland does not work as it should, the effects are felt in whatever part of the body the particular hormone controls. When there is too little hormone, a doctor may be able to remedy the condition by administering a hormone preparation. This may be an extract made from animal glands, or it may be a synthetic substitute—a medicine that has the same chemical formula as the hormone. When a gland produces too much hormone, a surgeon may be able to remove a part of the gland. This decreases the output of the hormone.

The Pituitary and Growth

The pituitary is a small gland suspended from the base of the brain by a thin stalk. It weighs only

0 5 to 0 6 gram (0 017 to 0 021 ounce) in grown men and somewhat more in women Its anatomical name is *hypophysis*, from a Greek word meaning "offshoot"

A hormone from the pituitary controls growth If for any reason the gland becomes larger than normal it makes too much growth hormone If this happens during childhood or youth the entire body continues to grow beyond normal size The person becomes big all over—a giant If overstimulation occurs after growth is complete, certain parts of the body start growing again, particularly the hands and feet and the bones of the face This condition is known as *acromegaly* ("large extremities")

If something reduces the output of hormone below normal before a boy or girl has finished growing, growth slows down or stops The person may become a dwarf Fortunately such disturbances seldom occur

The Master Gland

The pituitary makes other hormones besides the one that controls growth These stimulate and control other glands, particularly the thyroid, the reproductive glands, and the adrenal glands One of these, ACTH (adrenocorticotropic hormone) gives promise of being a remedy for arthritis It stimulates the adrenals to produce more of the hormone called cortisone or compound E This for reasons not yet understood, seems to help patients with arthritis Because its hormones stimulate other glands, the pituitary is sometimes called the "master gland"

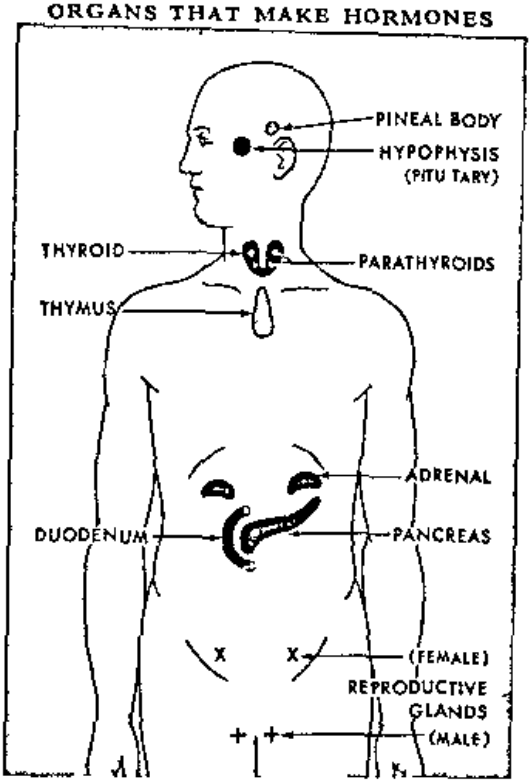
The pituitary is divided into a front section (anterior lobe) and a rear section (posterior lobe) The anterior lobe makes the hormones mentioned so far The posterior lobe makes a hormone that controls the output of urine A deficiency of this hormone causes *diabetes insipidus* a disease in which there is more urine than normal Injections of a posterior lobe solution (pitressin) made from the glands of animals remedies this condition

The Thyroid Controls Energy

The thyroid has two lobes joined by a band of tissue It is in the neck, with one lobe on each side of the trachea The band that joins them lies across the front of the trachea Each lobe is oval The entire gland weighs about an ounce

Hormone from the thyroid controls the rate at which the body changes food into energy When the gland does not produce enough hormone, the body develops

ORGANS THAT MAKE HORMONES



This diagram indicates the location of the ductless glands and other organs that make hormones For clarity the structures are shown larger in proportion than they actually are Those represented by crosses are present according to sex

energy slowly Its activities are sluggish This state is called *hypothyroidism* If it is very severe in *infancy* and lasts during childhood, the individual is a *cretin*—a dwarf with low mentality If it develops during maturity and is severe, he becomes dull mentally, he may be overweight his heart rate is slow and his skin is puffy and thick This condition is called *myxedema*

Help for the Thyroid

Doctors have been successful in treating cretinism and myxedema with thyroid substance from the glands of animals and with thyroxin the active principle of the thyroid hormone They may give iodine for milder hypothyroidism Iodine is an essential part of the hormone (*see* Iodine)

Excessive output of thyroid hormone produces *hyperthyroidism* Then the body uses up energy too rapidly The person is usually thin, nervous, and excitable, with a fast heart rate A surgeon may be able to relieve the condition by removing part of the thyroid gland, so that it will make less hormone Radioactive iodine may also prove to be a remedy A large part of iodine that is swallowed goes to the thyroid gland to become part of the thyroid hormone If the iodine is radioactive, rays emitted in the gland tend to destroy part of the tissue

Goiter is an enlargement of the thyroid gland The gland may grow large in an effort to compensate for some defect that has kept it from making enough hormone If the effort is successful, the person has a goiter but has a normal amount of thyroid hormone If the effort is not successful, there is goiter with hypothyroidism On the other hand, the original disturbance may have been enlargement of the gland In this case the gland secretes too much hormone There is goiter with hyperthyroidism

The doctor usually measures a patient's basal metabolic rate to determine whether his thyroid is working normally Since thyroid hormone controls the changing of food into energy or heat a low basal metabolic rate indicates an underactive gland and a high rate an overactive gland

Glands That Control Calcium

The parathyroids are pea sized glands set into the back part of the thyroid gland or near it Usually there are four, two on each side, but there may be one or two more or less

The parathyroid hormone regulates the balance of calcium in the body Too little of the hormone lowers

the calcium level in the blood. Too much raises this level, depriving bones and teeth of calcium.

A Hormone for Emergencies?

The idea that during fear or other emergencies adrenalin is poured into the blood stream is a popular one. This hormone is believed to raise the blood pressure, increase the heart rate, and otherwise prepare the individual to meet the emergency.

The glands that make this hormone—the adrenals—are located just above the kidneys. The right one is triangular and the left one half-moon shaped. They vary greatly in size, but the average is from 0.12 to 0 17 ounce. Each gland has two distinct parts: the inner *medulla*, and the outer *cortex*.

The medulla makes adrenalin. During ordinary times it makes and releases small amounts that have no known effect on the body. During stress it may produce larger amounts, and these may have the effects suggested. But this has not been proved. Nevertheless, hypodermic injection of prepared adrenalin (also called epinephrine) does stimulate the heart and the sympathetic nervous system.

The adrenal cortex makes several substances that are thought to be hormones, including cortisone. Their function, however, is even less well understood than that of adrenalin.

The Pancreas: Two Glands in One

The pancreas is both a gland with a duct and a ductless gland. It is situated just below the stomach. In shape it is like a bunch of grapes, 5 to 6 inches long, resting on its side. The broad part is at the right. The duct empties into the duodenum, the first part of the small intestine.

The pancreas has two kinds of cells. One secretes a digestive juice. This leaves the gland through the duct (*see* Digestion). Scattered through the gland are cells of another kind grouped in clusters like little islands. These are the islands of Langerhans, named for the man who discovered them. They secrete a hormone, *insulin*, into the blood.

Insulin regulates sugar metabolism. Lack of it causes *diabetes mellitus*. In this disease the body cannot make normal use of sugar or of the proteins which digestion changes into glucose. Great quantities of sugar appear in the blood and urine. Interference with the use of fat is a secondary effect. Diabetes mellitus was once fatal. Now it is controlled with insulin from the glands of animals.

The duodenum is not a gland, but it makes a true hormone, *secretin*. This stimulates the liver to form bile and the pancreas to form pancreatic juice.

The reproductive glands (ovaries in the female, testes in the male) function, like the pancreas, both as ductless glands and as glands with ducts. The cells of new life originate in them. So do various hormones that are secreted into the blood and lymph. These hormones affect the development and functioning of the individual as male or female.

The pineal body is sometimes included among the ductless glands, but it serves no known purpose. It is a cone-shaped projection about 8 mm. long at the center of the brain. The 17th-century French philosopher René Descartes believed that it was the dwelling place of the soul. Many scientists believe that in some remote ancestor of mammals and man it was a third eye.

The thymus is also a puzzle to physiologists. It is irregular in shape, with two unequal lobes. It is largest at puberty, when it weighs about 1.2 ounce and lies partly in the chest cavity and partly in the neck. Then it grows steadily smaller, withdrawing from the neck. It was once thought to influence growth, but no connection has been proved.

Other Names for the Ductless Glands

The ductless glands are also called glands of internal secretion, because the hormones they make do not leave the interior of the body, as the secretions of other glands do (*see* Gland).

A third name for them is endocrine glands. Endocrine comes from the Greek words *endon*, meaning "inside," and *krinein*, meaning "to separate." (The glands separate substances from the blood.) The study of hormones and endocrine glands is endocrinology.

HORN. There are two kinds of horn, one the continued growth of bone, the other a hardening of the epidermis. Corns that grow on our toes, the hard spots on a camel's knees, the tortoise's shell, the scales of snakes and lizards, birds' beaks, horses' hoofs, the horns of sheep and cattle, and the fingernails and toenails of man and animals, are the latter, or true horn. It is closely related in growth and composition to hair, and is made up of about 50 per cent carbon, with hydrogen, oxygen, nitrogen, and sulphur.

The deer's horns or antlers are examples of the first kind of horn, which is really a bone outgrowth. During the growing period such horns are covered with a sensitive velvety skin, which later peels off, leaving the hard, solid antlers. These are usually shed once a year. Beneath the sheath of true horn in the case of oxen, sheep, and antelope, are frontal bone outgrowths constituting a core. Except for those of the pronghorn antelope, such horns are never shed. Neither are those of the giraffe and the rhinoceros, which are thickened hardened masses of skin and hair, covering independent bones. Horns may be solid or hollow; in the latter case they are usually found on the female as well as on the male.

Primitive man used horn for weapons, drinking cups, and handles; then later for powder horns and musical horns. Since true horn can be softened and split into thin sheets which are tough, pliable, and easily molded, many articles both useful and ornamental have been made from it. By a dexterous mixing of dyes, common horn can be made to look like expensive tortoise shell. Formerly thin horn plates were used in window-panes and lanterns, and horn is still used in making combs, buttons, and handles for umbrellas, canes, knives, and forks.

HORN, MUSICAL. When a musician or concertgoer speaks of "the horn" he is referring only to the French horn. Popularly, however, brass instruments of all kinds are often called horns. Except for the

saxophone these instruments all con sist of a tapered metal tube with a mouthpiece at one end and a flaring bell at the other For convenience and appearance the tube is twisted and coiled in various ways but this has no effect on pitch and little on tone quality

To produce tone the player tenses his lips against the mouthpiece and makes them vibrate by blowing The vibration is amplified and changed to a musical tone by the tube and bell In the bugle the simplest brass in strument the various notes are pro duced solely by changing the *em bouchure* (position and tension of the lips) These notes are few and at odd intervals In most brasses valves are used to obtain the full chromatic scale These have the effect of length ening the tube and lowering open tones from one to six semitones

The French horn owes its graceful coiled shape to the fact that it was once a hunter s horn Straightened out it is about 16 feet long The modern horn is fitted with three ro tary valves to make the full chromatic scale It is an extremely difficult instrument to play as the slightest variation in embouchure causes false notes In the orchestra horns are used in pairs one player taking the upper register and the other the lower The tone of the horn is pure full and extremely sweet Hence the instrument is more closely associated with the wood winds than with the other brasses

The other common brass instruments of the sym phony orchestra are the trumpet the trombone and the tuba The tube of the trumpet is about eight feet long and only three eighths of an inch in diameter until within 15 inches of the bell There are three valves of the piston type Its narrow tube gives the trumpet a brilliant and penetrating tone The slide trombone has no valves It uses a U-shaped part of the tube which slides in and out to vary the pitch of open tones The rich resonant voice of the trom bone is due partly to the fact that it has none of the short twists and crooks which valve instruments have The valve trombone used sometimes in military bands has an inferior tone The bass voice of the brass section is supplied by the tuba It is an in strument of the saxhorn family introduced by Adolphe Sax in 1845 These brasses are characterized by broadly flaring tubes and very resonant tone (*See also* Orchestra)

Mil tary bands employ many brasses not used in symphony orchestras The cornet and fluegelhorn for example are trumpetlike instruments The alto horn and baritone horn or euphonium are types of sax horns The mellophone is often used in place of the French horn and the sousaphone in place of the tuba The saxophone is a hybrid a brass instrument with reed mouthp ece (*See also* Musical Instruments)

A STRANGE MEMBER OF THE HORN FAMILY



The melancholy notes of the a penhorn echo across the valley as a Swiss moun taineer pra t ces an old tune Alpenhorns or alphorns made of hollowed wood sections are up to 12 feet long They are sometimes used to call cows home

HORNBILL Great beaks surmounted by bony crests or helmets and prominent eyelashes distinguish these strange bulky birds (*Bucerotidae*) of Africa and the Malay region Their food consists mainly of fru t and insects Those of the larger species (about four feet long) also kill and eat the largest and deadl est snakes Hornbills nest in holes in trees The male plasters up the entrance with mud until only a small window remains Through this he passes food to the female and young imprisoned within

HORNET Several large members of the wasp fam ily are called hornets They are social insects build ng nests of paperlike pulp Their thick bod es are usually black or dark brown marked with brilliant white or yellow This coloring has earned for some of them the name yellow jackets If their nests are attacked they show so irritable a disposition and sting their attackers so painfully that they fully just fy the common expression as mad as a hornet If let alone however they are interesting and indus trious workers Hornets do some damage to fruit but they also make up for it by killing many harmful insects (*See also* Wasps)



Poco Bueno, a Champion Quarter Horse Stallion, and His Rider "Cut Out" a Calf

MAN'S *Friend and Servant, the* HORSE

HORSE. For their work and play men use horses in many ways. With them cowboys herd cattle and farmers pull plows and harvesting machinery. Horses aid the Texas Ranger and the Royal Canadian Mounted policeman to keep law and order in the wilds. Gentle little horses called ponies carry children on their backs, and bigger, more lively ones carry pleasure riders over the cinder paths of city parks and country trails. At race tracks spectators cheer as fast horses thunder down to the finish line, and at the circus audiences applaud the performance of trained horses.

Before an Asian tamed a horse some 10,000 years ago men had used horses only as food. The first book of the Bible tells of horses being used for pulling chariots and for riding. The ancient Greeks and Romans harnessed horses to chariots and raced them in thrilling contests.

How Different Kinds of Horses Are Developed

Farmers and loggers need big, strong horses to pull heavy loads. Racing men want light, tall horses that will run fast. Cowboys and polo players must have small horses that can start, run, dodge, twist, turn, and stop quickly. Pleasure riders want fine looking, lively horses that are comfortable to ride. (*See also* Cattle; Circus; Polo.)

No one horse could do and be all these things. Men get the kinds of horses they need by *selective breeding*. In selective breeding male and female horses with especially desired qualities are mated. For this reason horses are said to have "the blood" of their fathers and mothers or even to have "the blood" of a famous ancestor of many generations back (*see* Heredity).

Horses that have a specific group of qualities and that almost invariably transmit these qualities to their young are *purebreds* of a single *breed*. For the better-known breeds, see the table that appears later in this article.

Special Words Used in Talking of Horses

A male horse is a *stallion*. If he is spoken of as a father he is called a *sire*. A male horse that has been desexualized is called a *gelding*. A female horse is a *mare*. If she is spoken of as a mother she is called a *dam*. During their first year young horses of both sexes are called *foals*, and during their second year, *yearlings*. Horses are said to be the *get* of their parents. A young male horse is called a *colt* and a young female horse, a *filly*. The parts of a horse's body are named in the picture on the next page.

A foal is born with its eyes open about 11 months after its conception. Within a few minutes of birth it can stand and walk. A foal takes milk from its dam usually for four or five months. A foal's first teeth, called "nippers," soon appear at the front of its jaws, and at the end of ten months it has grown a full set. Permanent teeth begin to grow in a horse's third year, and it has all its teeth by the end of its sixth year. Teeth reach full growth during the horse's tenth year. A gap between the front and rear teeth is called

a *bar* and in bridling the horseman places the bit in this gap

Enamel ridges stand out from the softer dentine and cement of a horse's teeth These ridges completely wear away by the horse's eleventh year A horseman can accurately tell a horse's age up to its eighth year by the condition of these ridges (*see* Teeth)

The height of a horse is the distance between the ground and its *withers* A horse is measured in hands —one hand equals four inches Thus a horse that measures 14-2 (or 14½) hands has withers 58 inches above the ground

The First Purebred Horse

Ancient Greek and Roman sculptures show small compact horses that have small heads with prominent foreheads From forehead to muzzle the outline of the head is slightly concave or "dished " The modern *Arabian Horse* also looks like this, and so it is probable that the Arabian Horse has been a purebred for more than 2,000 years (For picture, *see* Greek and Roman Art)

Although the Arabian Horse accompanies its master on camel caravans, it is ridden only in emergencies When danger threatens or a raid on a weak, rival caravan promises, it bears its rider swiftly and tirelessly The Arabian's master watches over it jealously, and at night a specially treasured dam and her foal are sheltered in their master's own tent

Arabian Horse blood runs in the veins of almost all light breeds The *Barb* (for Barbary Coast) of North Africa although larger, carries much Arabian blood Both the Arabian and the Barb are also called 'Oriental" horses

Heavy Breeds of Horses

The horses that do the heaviest work are called *draft* horses Their ancestors were native to the Flemish lowlands, now the Netherlands Belgium and a northern section of France These were the *Great Horses* of Europe The Great Horses were ridden by heavily armored knights and soldiers William the Conqueror's invasion of England in 1066 was aided by Great Horses Crusaders rode them as they battled for the Holy Land (*See also* Armor, Huns, Hundred Years' War, Smith)

With the invention of gunpowder, speed became more essential than armor and the big horses were turned over to farmers and wagoners who before this had used oxen Through selective breeding the Great Horses were developed to even larger size

In France s La Perche district the Great Horse became the *Percheron* which at the start of its development was also called the Norman It is believed that some Arabian blood was bred into the Percherons The United States imported its first Percherons in the 1840's and it now has more horses of Percheron blood than of any other draft breed (*see* Agriculture)

Another great draft breed developed in Belgium, is called the *Belgian Horse* England and Scotland developed three great draft breeds the *Suffolk Punch* the *Shire* and the *Clydesdale* America has few Suffolk Punches, but it has many of the other two breeds

The Shire, biggest of all horses was developed in central England From knees and hocks down it grows long hair called "feather " The Clydesdale developed in Scotland, has a high and lively step Feather grows at the sides and backs of its lower legs

Coach and Heavy Harness Horses

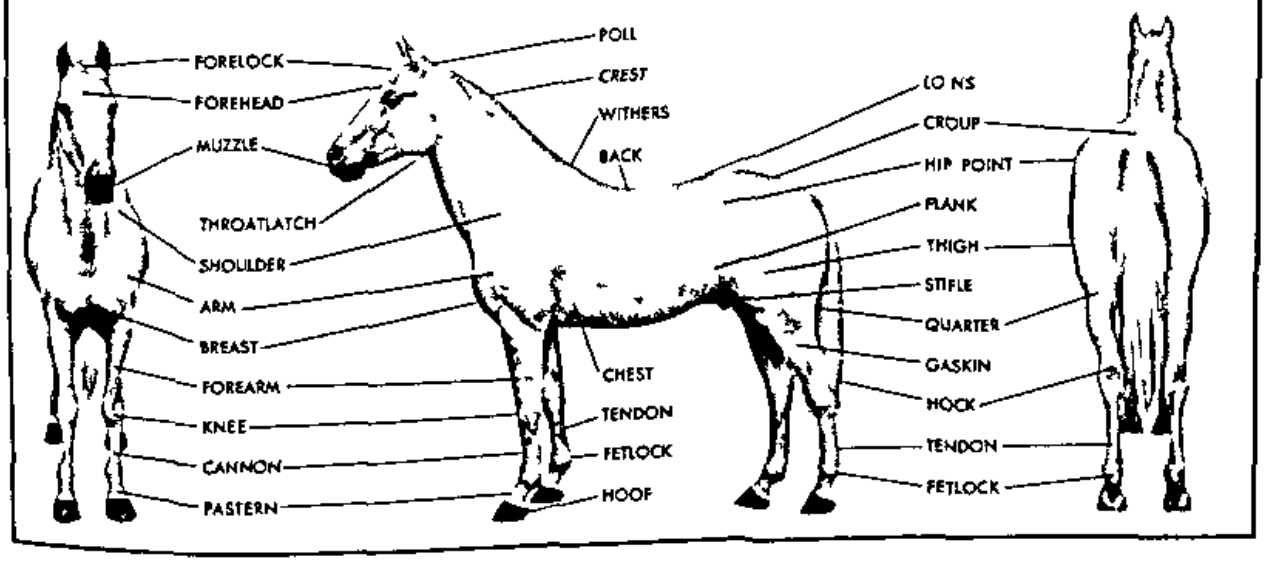
Before the days of the railroad, middle-sized horses pulled stagecoaches Such horses needed to trot hour after hour France and England respectively developed the Percheron and the *Cleveland Bay*, other countries developed like breeds

London's public street coaches were named for the *Hackney Horse*—that is one let out for hire These horses developed a much admired action—high lifting head and feet They became the Hackney breed, which now is one of the most attractive breeds of show horses

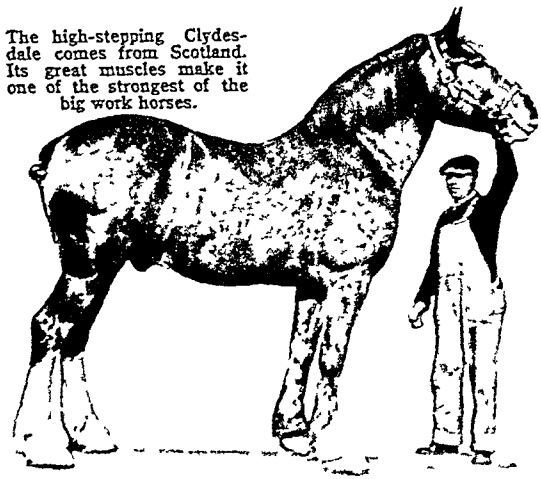
The Smallest Horses

Horses that measure less than 14-2 hands are called ponies The best-known breeds in America are the

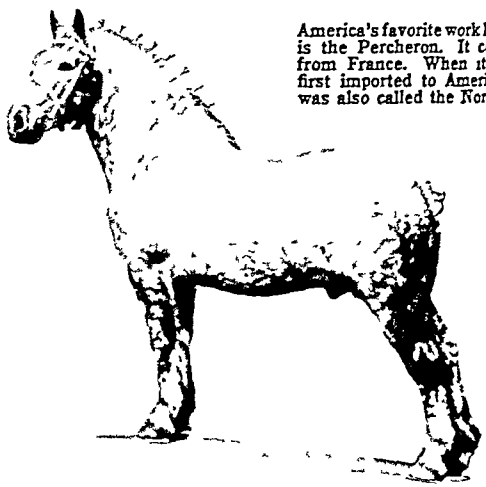
THE PARTS OF A HORSE NAMED ON AN ARABIAN



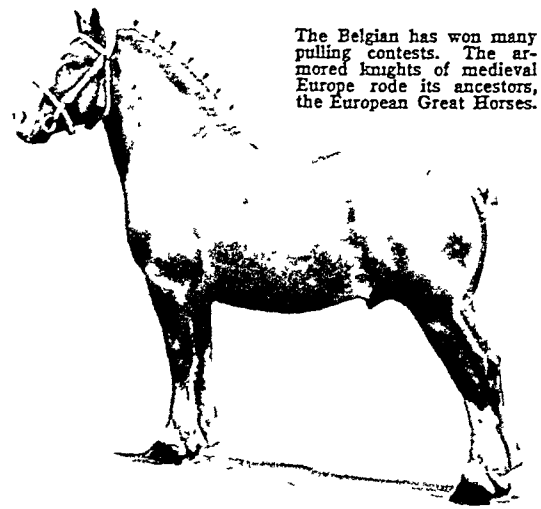
FOUR GREAT DRAFT HORSES



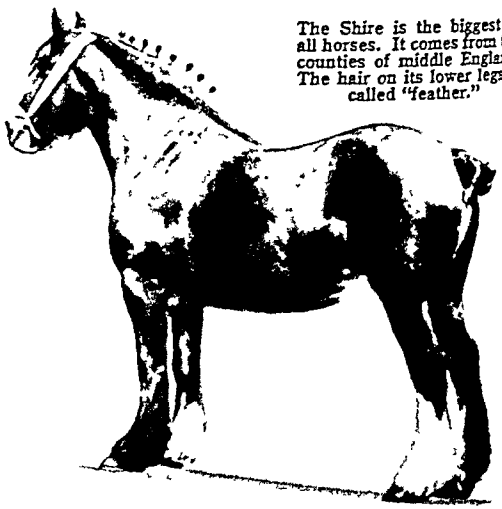
The high-stepping Clydesdale comes from Scotland. Its great muscles make it one of the strongest of the big work horses.



America's favorite work horse is the Percheron. It comes from France. When it was first imported to America it was also called the Norman.



The Belgian has won many pulling contests. The armored knights of medieval Europe rode its ancestors, the European Great Horses.



The Shire is the biggest of all horses. It comes from the counties of middle England. The hair on its lower legs is called "feather."

Shetland and *Welsh* ponies. Some Shetlands reach 11–2 hands and weigh up to 500 pounds. They grow long, shaggy hair in the winter. The Shetland's short legs and rounded body make it appear a midget draft horse, and in its native land it is so used.

The Shetland comes from the Shetland Islands, an island county far north of Scotland (*see* Shetland Islands). The islands—rugged, with long, cold winters—grow little grass. The hardships, scarcity of food, and inbreeding account for the Shetland's small size. Because the Shetland is gentle and playful, it has become a riding and harness pony for small children.

The Welsh Pony is descended from the early small English horse and, judging from its sleek appearance, from the Arabian. It weighs from 600 to 850 pounds and ranges from 12 to 14-2 hands high. The Welsh Pony is gentle and has considerable dash and style. It is popular as a saddle and harness pony for older children. In Welsh mines it pulls heavily loaded, underground coal cars.

Other small horses are the *Iceland Horse*, which has a large head and shaggy hair (*see* Iceland), and the *Chincoteague Pony*, which runs wild on islands near the Virginia coast. Legend says that the Chincoteague ponies are descendants of horses that swam ashore from a wrecked Spanish galleon. They have become small because of inbreeding and lack of food. Once a year the Chincoteague ponies are rounded up; the best are sold and the others turned loose again.

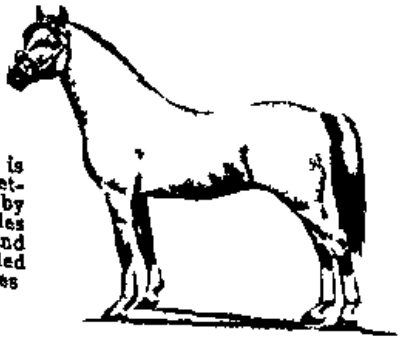
The Light Horses

Horse races began sometime in prehistory when two men first argued as to which owned the faster horse. In England races were run so that traders could show the quality of the horses they wanted to sell. During the 1300's regular race meets were held. Because English kings followed racing enthusiastically, it is often called the "sport of kings." James I, who ruled from 1603 to 1625, was the first English king to encourage the breeding and racing of light horses. He established a great racing center at Newmarket.

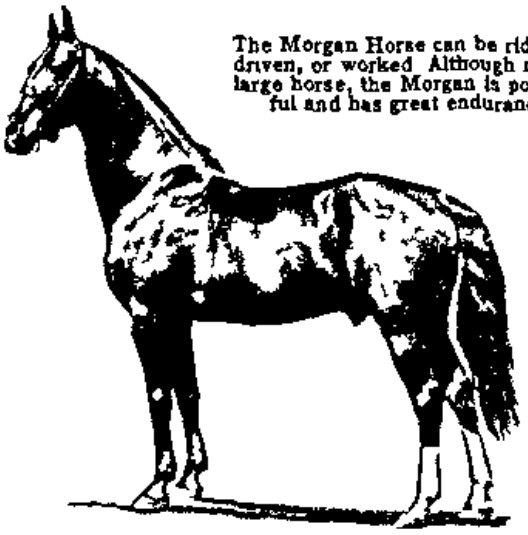
TWO PONIES AND SIX FINE LIGHT HORSES



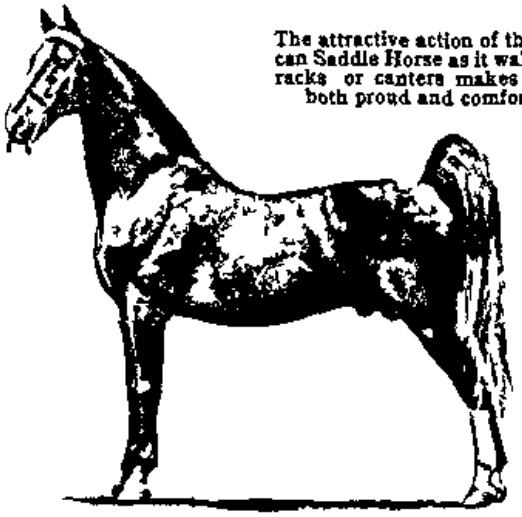
These two children are riding a Shetland Pony It is gentle and playful the perfect small horse for little children It comes from the cold Shetland Islands



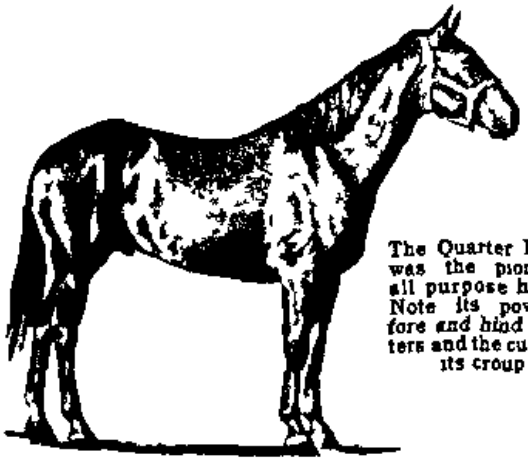
The Welsh Pony is larger than the Shetland It is ridden by older children In Wales it is used underground to pull heavily loaded cars in the coal mines



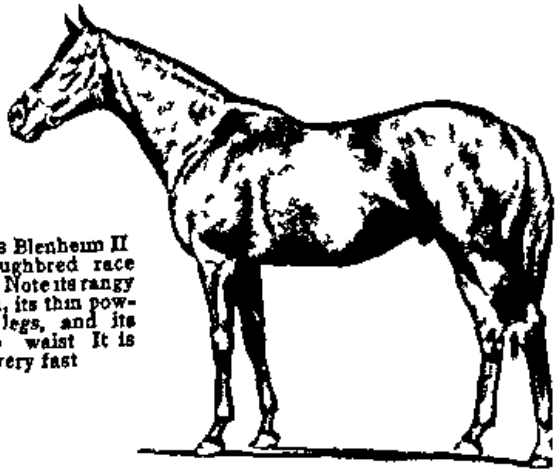
The Morgan Horse can be ridden driven, or worked Although not a large horse, the Morgan is powerful and has great endurance



The attractive action of the American Saddle Horse as it walks trots racks or canters makes its rider both proud and comfortable.

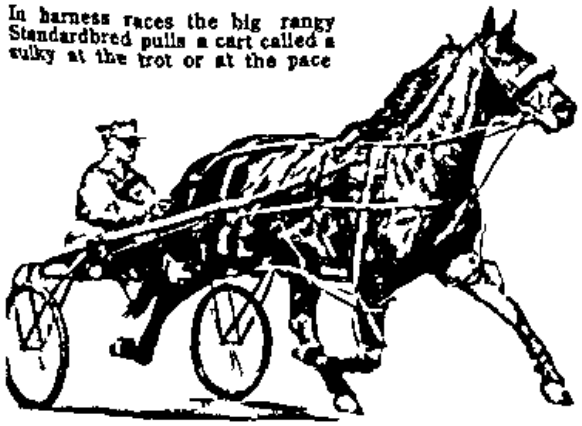


The Quarter Horse was the pioneer s all purpose horse Note its powerful fore *and hind quarters* and the curve of its croup



This is Blenheim II Thoroughbred race horse Note its rangy length, its thin pow*erful* legs, and its 'wasp waist It is very fast

In harness races the big rangy Standardbred pulls a cart called a sulky at the trot or at the pace





The Hackney is the showiest of all the harness horses Note its proudly arched neck and its high lifted feet

English racing led to the development of the pure-bred known as the Thoroughbred. All American and English Thoroughbreds of today have the blood of one or more of three Oriental sires brought to England: the Byerly Turk, imported in 1689; the Darley Arabian, imported in 1706; and the Godolphin Barb (or Arabian), imported in 1724.

The American Thoroughbred

English, Dutch, and French colonists in America raced horses before the end of the 1600's. The desire to own horses that could win led to the importation of the fast English horses before they were generally known as "thoroughbreds."

American breeding and racing first centered in Virginia. As Tennessee and Kentucky were settled, fast horses were bred there too. Today the American Thoroughbred is raised from New England to California, but the "blue grass" region of Kentucky is the most famous race-horse breeding region of all (*see* Kentucky).

The Spanish Horse

America had no horses when it was discovered by Columbus in 1492. The Western wild horses—known by such names as broncho, cayuse, mustang, pinto, Indian pony, and broomtail—are descendants of horses strayed or stolen from such Spanish explorers as Cortez and De Soto. The Spanish horses were quite good because they had the blood of Arabian and Barb ancestors.

Although white men and Indians have rounded up thousands of wild horses, there are still a few bands roaming the West. Today the best of those captured are broken and sold, and the poor ones are slaughtered for meat, some of which becomes human food and the remainder, food for cats and dogs.

The best of these wild horses are small, quick and fast, and have great endurance. The get, or offspring, of Spanish and breed matings are even better, and many fine Western horses of today are the result of such matings.

Other American Breeds

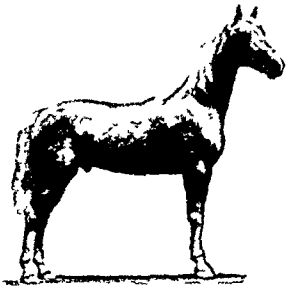
The light breeds developed exclusively in America are the Quarter Horse, the Morgan Horse, the Standardbred Horse, the American Saddle Horse, and the Tennessee Walking Horse. In addition, Americans have developed several horse types distinguished for colors. Horse breeders of each breed and type have formed associations. Only horses that meet rigid standards of ancestry, conformation (shape and structure), performance, or color can be registered with these associations.

The *Quarter Horse* was developed from the earliest horses brought to America, and so it has Spanish and English horse bloods and, through these, Arabian blood. Imported Janus, an Arabian brought to America in 1752, was probably the most influential single sire of the breed.

The Quarter Horse served the colonists as both a light work and carriage horse, but its greatest value lay in its speed at short distances over wilderness trails. The colonists held races on short, straight courses cleared from the forest. These races, about a quarter of a mile long, gave the breed its name. The Quarter Horse was the perfect horse for the frontiersmen's needs, and as they pushed the frontier westward they took their Quarter Horses along.

Today the Quarter Horse is a fine ranch horse. It has been improved by the addition of Thoroughbred blood. Quarter Horse stallions, particularly in the Southwest, are mated with the finer mares of unknown breeding to improve the common ranch, or stock, horse quality. Quarter-mile races are still popular.

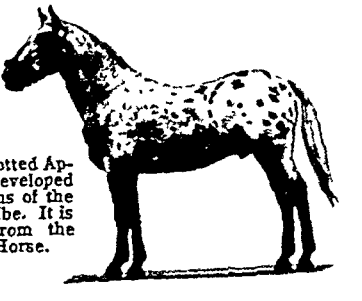
SOME OTHER LIGHT HORSES



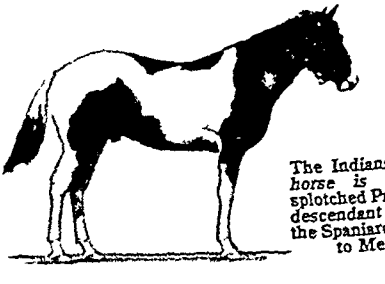
The beautiful golden Palomino is a color type rather than a breed. It makes a good ranch horse and a showy parade horse.



The white Lipizzan is called a "high-school" horse because of its long training. It comes from Austria.



The oddly spotted Appaloosa was developed by the Indians of the Nez Percé tribe. It is descended from the Spanish Horse.



The Indians' favorite horse is the gaily splotched Pinto. It is a descendant of horses the Spaniards brought to Mexico.

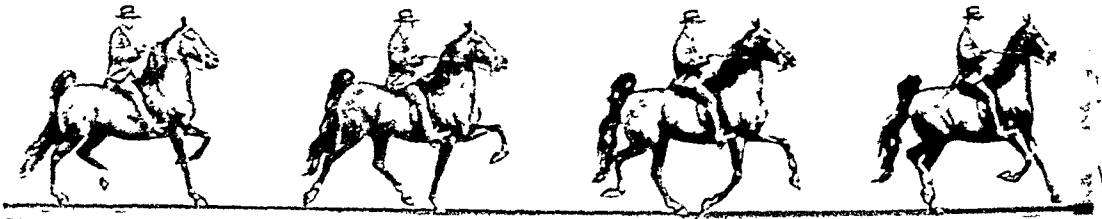
BREEDS AND COLOR-TYPE HORSES

Breed	Place of Origin	Breeds from Which Developed	Founda tion Sires	Principal Use	Usual Height Range (Hands*)	Usual Weight Range (Pounds)	Common Colors
WORK COACH AND CARRIAGE HORSES							
Percheron	France	Great Horse dash of Arabian		Draft	16 to 17	1 600 to 2 100	Gray black
Belgian	Belgium	Great Horse		Draft	16 to 17	1 700 to 2 100	Chestnut bay roan
Clydesdale	Scotland	Great Horse native stock		Draft	16 to 16-3	1 600 to 2 000	Bay brown black
Shire	England	Great Horse native stock		Draft	16-2 to 17 2	1 800 to 2 200	Bay brown black chestnut gray roan
Suffolk Punch	England	Great Horse native stock		Draft	15-2 to 16 2	1 600 to 2 000	Chestnut
Cleveland Bay	England	Thoroughbred native stock		Coach	16 to 16-3	1 250 to 1 550	Bay with black points
Hackney	England	Thoroughbred native stock	Blaze	Carriage	14-2 to 15 2	900 to 1 100	Bay brown chestnut
LIGHT HARNESS AND RIDING HORSES							
Arabian	Asia Minor	Arabian		Riding	15 to 15 1	750 to 1 000	Chestnut bay brown gray
Barb	North Africa	Arabian native stock		Riding	14 2 to 16	850 to 1 150	Bay gray chestnut brown
Thoroughbred	England	Arabian Barb native stock	Byerly Turk Darley Arabian Godolphin Barb	Riding	15 to 17	850 to 1 350	Chestnut bay black brown gray
Quarter Horse	America	Spanish Thoroughbred	Imported Janus†	Riding	14 to 15	800 to 1 200	Chestnut bay brown
Morgan	America	Unknown—assumed to be Arabian Thoroughbred	Justin Morgan	General purpose	14 to 15	800 to 1 000	Bay brown chestnut black
Standardbred	America	Arabian, Thoroughbred Morgan various pacing and trotting stocks	Messenger Rykdyks Hambletonian	Harness racing	15 to 16-1	850 to 1 200	Bay brown chestnut roan gray black
American Saddle	America	Thoroughbred Morgan pacing stock	Denmark	Riding	14-2 to 16-1	900 to 1 200	Bay brown black gray chestnut
Tennessee Walking	America	Standardbred Thoroughbred Morgan American Saddle	Allan F 1	Riding	15 to 16	950 to 1 200	Bay black chestnut roan gray
COLOR TYPE HORSES							
Palomino	Mexico United States	Arabian Spanish Thoroughbred		Riding	15 to 16	1 000 to 1 200	Gold (several shades)
Pinto	Mexico United States	Spanish		Riding	14 to 15-2	800 to 1 000	Black and white spotted or white and another color
Appaloosa	United States	Spanish		Riding	14-2 to 15-2	800 to 1 050	Roan chestnut white small round or oval white or color spots
Albino	United States	Uncertain some Arabian, Morgan	Old King	Riding	12 2 to 16	900 to 1 300	Solid white
PONIES							
Shetland	Shetland Islands	Unknown		Riding or Harness	to 11 2	to 500	Brown black chestnut some spotted
Welsh	Wales	Arabian Thoroughbred native stock		Riding or Harness	10 to 12 2	400 to 650	Chestnut bay gray black, roan white
Hackney	England	Thoroughbred native stock		Riding or Harness	12 to 14 2	600 to 850	Bay brown chestnut

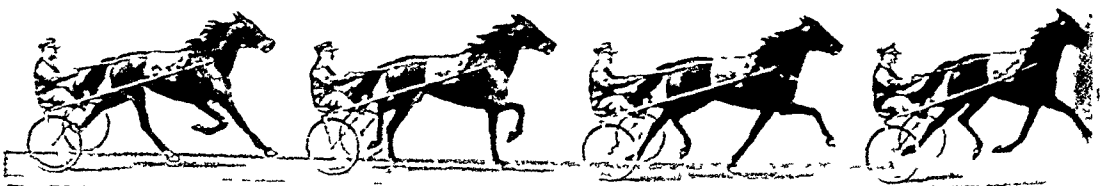
*1 hand equals 4 inches †The most important early sire



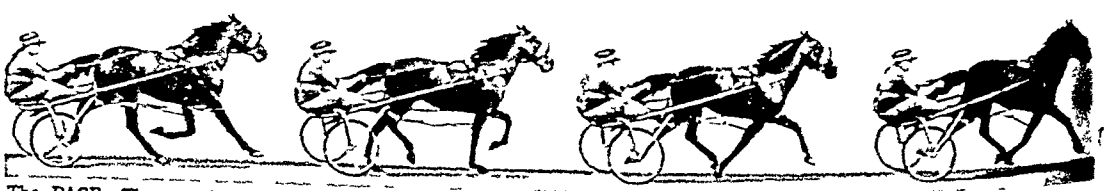
The WALK. Society Sensation performs the Running Walk. It is an evenly-spaced four-beat gait in which the hoofs strike the ground in this order: (1) Left front; (2) right rear; (3) right front; (4) left rear. The Running Walk, the special gait of



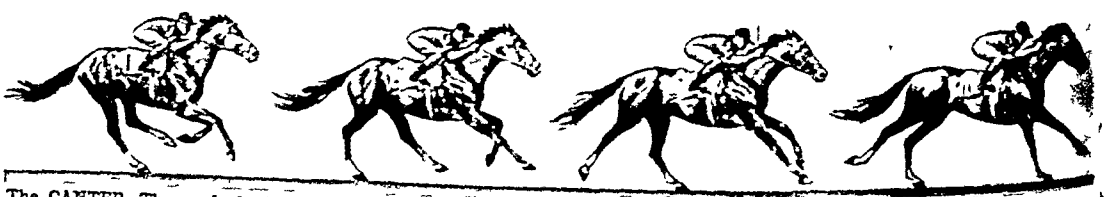
The RACK. The American Saddle Horse Golden Butterfly, a five-gaited champion, demonstrates the Rack, which sometimes is called the Singlefoot. The Rack is fast and flashy. It is an evenly-spaced four-beat gait in which the hoofs strike the



The TROT. The Trot is one of the two racing gaits of the Standardbred. It is also a riding gait. In going from walk to canter, a horse uses it as a transition gait. The Trot is a two-beat gait with the hoofs striking the ground in this order:



The PACE. The pace is the second gait at which harness horses race. It is a two-beat gait in which the front and rear hoofs of the same side take off and strike the ground together. The hoofs rise only a very little above the ground. For



The CANTER. The run is the fastest canter. Citation demonstrates the four-beat gait as he wins the 1948 American Derby. His hoofs strike the ground in this order: (1) right rear (2) left rear; (3) right front; (4) left front. As he gathers

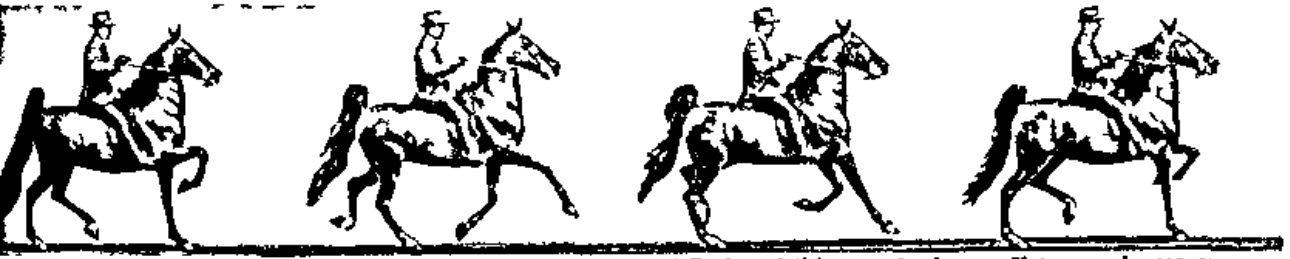
The *Morgan Horse* is equally good under saddle or in harness as a work and carriage horse. The breed sprang into being all at once in its sire, Justin Morgan (named for one of its owners), foaled about 1790. Justin Morgan was famed as a work, carriage, and saddle horse, and all his get and the get of most of his descendants inherited his qualities. A story is told that, on a bet, Justin Morgan, only 14 hands high, was set to pull a large log embedded in the ground that a big team had failed to budge. At command Justin Morgan tightened the chain. The log did not move, and the strong little horse flattened on its haunches and strained forward until the log first quivered, then broke loose. It is told that Justin Morgan pulled the log to where it was wanted at a trot.

The Morgan Horse has also been used as a harness racer. Its blood has been bred into the Standardbred and the American Saddle Horse. Morgan stallions are also mated to mares of unknown breeding to "upgrade" the get (to improve the quality of descendants).

FIVE MOST IMPORTANT GAITS



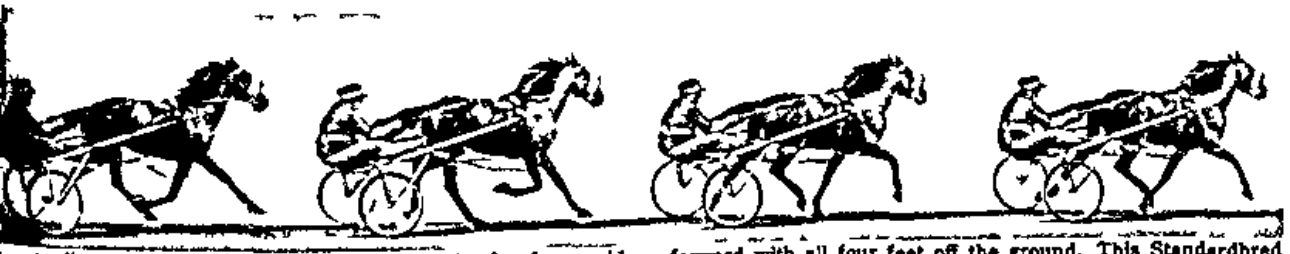
the Tennessee Walking Horse, is slightly faster than the ordinary Walk. In performing it the rear foot of the Walking Horse over reaches by as much as 26 inches the point from which the front foot of the same side has just been lifted



ground in this order (1) right front (2) left rear, (3) left front, (4) right rear The Rack is easy on the rider but difficult and tiring on the horse Not many horses can perform it for more than a few minutes without breaking stride



(1) Left rear and right front, (2) right rear and left front. Between each beat for an instant all four hoofs are off the ground. The action is smooth, low and seemingly effortless Demon Hanover a Hambletonian Stake winner, shows the Trot.



a split second at the moment when the hoofs of one side rise and the hoofs of the other reach forward, the pacer floats forward with all four feet off the ground. This Standardbred is Knight Dream, the greatest three-year-old pacer of 1948



his feet under him for the next 1-2-3-4 contacts he floats through the air A Thoroughbred must be sound to withstand the strain of the run These pictures are from the slow-motion moving picture Horses Gaits, by permission of Wayne Dinsmore

The tall fast angular *Standardbred* was first developed as a fast carriage horse, and then as a harness racer at the trot and pace Except for its angularity it looks much like the Thoroughbred Its ancestry includes Arabian Thoroughbred, and Morgan bloods The foundation sire of the breed is Ryksdyk's Hambletonian foaled in 1849 Standardbred blood has been used to upgrade Western stock horses polo horses and pleasure horses Standardbred-draft crosses produce excellent middle-sized work horses The Standardbred pulls a light two-wheeled cart called a sulky Its fastest mile at the trot is 1 minute and 55¼ seconds, at the pace, 1 minute and 55 seconds

The *American Saddle Horse* is the showiest of the light breeds Its head, on a finely arched neck, is carried proudly and its feet are lifted high and placed firmly and precisely Riders find its several gaits comfortable It was developed by farmers and plantation owners of Virginia Tennessee, Kentucky, and Missouri as a fine riding and carriage horse

Its ancestry includes both Thoroughbreds and Morgans. A pacing ancestry contributed to its comfortable saddle gaits. The foundation sire was Denmark, a Thoroughbred foaled in the 1830's. The American Saddle Horse has been used to upgrade pleasure and Western stock horses. Its blood contributes to the splendid riding qualities of the Tennessee Walking Horse

The *Tennessee Walking Horse* can walk so fast that its gait is called the "running walk." This great saddle horse, bred by plantation owners of middle Tennessee, can carry its master all day long at a walk that covers from six to seven and a half miles an hour. At the running walk, the Tennessee Walking Horse's head bobs in time to its movements. The breed was developed from Thoroughbred, Morgan, Standardbred, and American Saddle Horse bloods. Its foundation sire was Allan F-1.

The Color Type Horses

The horses bred for color are Palominos, Pintos, Albinos, Appaloosas, Buckskins, and American Creams. All except the American Cream, a draft horse, are saddle mounts, used by cowboys, pleasure riders, and parade riders.

Of these the golden-hued Palomino and the large-spotted Pinto are the best known. Besides Spanish blood the Palomino may have one or several more bloodlines, including American Saddle, Arabian, or Tennessee Walking Horse. The Pinto is a descendant of the Spanish Horse. Appaloosas are queerly spotted Spanish Horses developed in the 1800's by the Nez Percé Indians of the Northwest.

Horse Shows

Horse shows encourage owners and breeders to improve the conformation, quality, and performance of their horses, and thus the breeds themselves These shows are held at state and county fairs and at other livestock exhibitions.

Large shows have classes for all breeds, including draft, harness, and riding horses. The most colorful classes are the three-gaited and five-gaited saddle horses, the harness horse, and the Hunter and Jumper Many Western shows have classes for cattle-working and parade-type horses. The Hunter is judged on its conformation, soundness, and its way of going and of making its jumps; the Jumper is judged only on its ability to clear the jumps. Pictures of a Hunter are shown in the article on Motion Pictures.

Three-gaited horses show the common gaits the *walk*, the *trot*, and the *canter* (a slow *gallop* or *run*) The five-gaited horses, in addition to these, show the *stepping pace* (also called the *slow gait* or *slow rack*) and the *rack* (also called the *singlefoot*). (For pictures of these, *see* the pages on Gaits.)

Specially trained horses, such as are exhibited on the stage and in circuses, are called "high-school" horses. The most skilled of the specially trained horses are the Austrian Lipizzans, all-white horses that have been trained for seven or more years

The Ass and the Mule

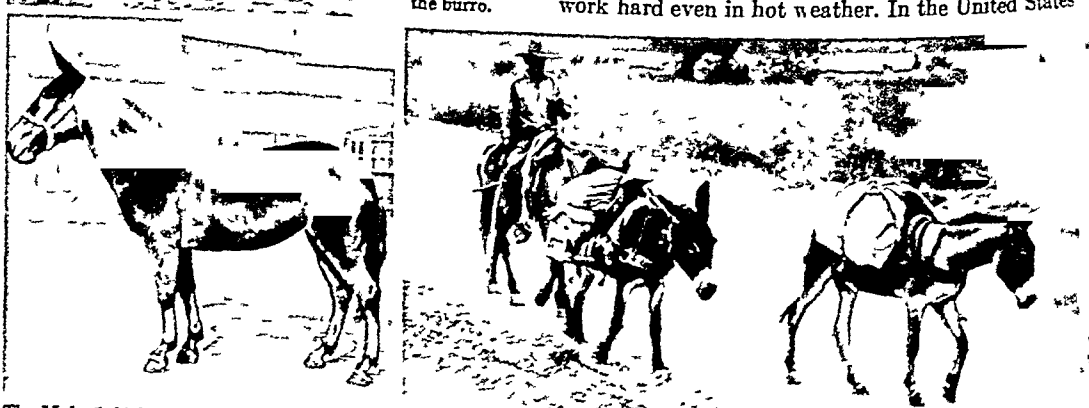
The ass, or donkey or burro, is a cousin of the horse; its scientific name is *Equus asinus* (*see* Ass) Asses may be as small as a Shetland or as large as a small work horse. In Mexico and in the Western United States the smaller asses, called burros, are used as pack animals.

The mule, the get of a male ass and a female horse, is a hybrid. Only rarely can a female mule have young; a male mule has never sired young. The result of crossing a male horse and a female ass is the *hinny*, which is not a good work animal. A mule can work hard even in hot weather. In the United States

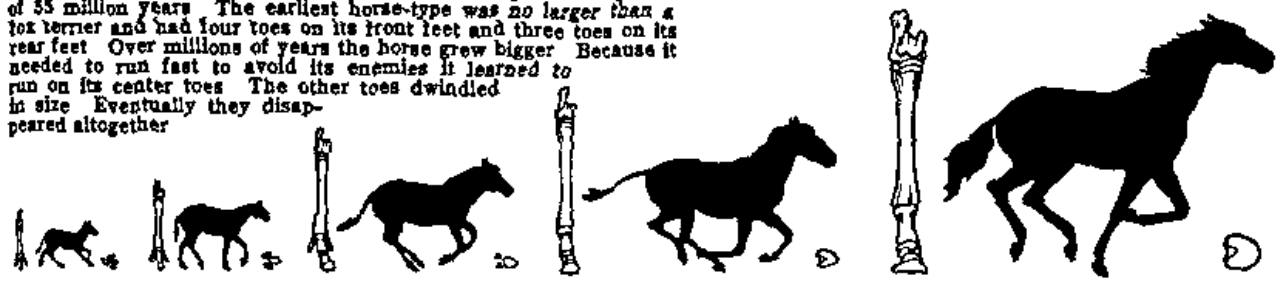
SOME RELATIVES OF THE HORSE



For many centuries the ass has helped men by carrying burdens. It also is called the donkey or the burro.



The Mule (left) is the get of a male ass, or jackass, and a female horse, or mare. It can work hard in quite warm climates Small asses (right), called burros in Mexico and in the western part of the United States, carry a prospector's supplies



From fossils men have learned how the horse developed over a period of 55 million years The earliest horse-type was *no larger than a* fox terrier and had four toes on its front feet and three toes on its rear feet Over millions of years the horse grew bigger Because it needed to run fast to avoid its enemies it *learned to* run on its center toes The other toes dwindled in size Eventually they disappeared altogether

many mules are used in the cotton fields they also serve as general draft animals Sold ers use them as pack animals in mountainous regions A horse hot from exercise that overeats or overdrinks suffers an ailment called founder The mule refuses to over eat or overdrink at any time

Declining Use of Horses and Mules

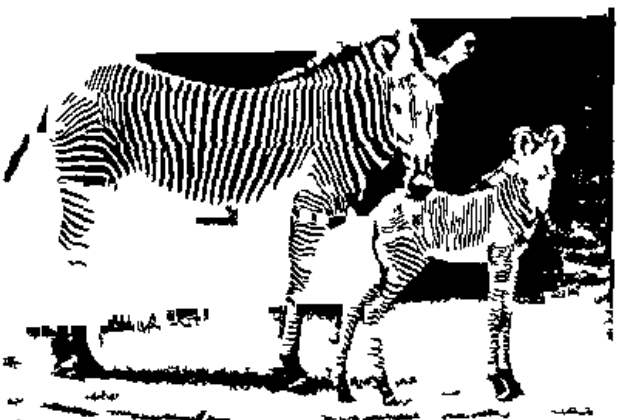
Mechanical substitutes for power and transport such as the railroad truck and tractor have cut down the number of horses and mules (*see* Transportation) In 1900 American farms had 18 267 000 horses and 3 265 000 mules The numbers increased until 1920 but then began to decline In 1950 American farms had only 5 274 000 horses and 2 149 000 mules

The ten states which in 1950 had the largest num bers of farm horses and mules were

Horses		Mules	
Texas	352 000	M ss ss pp	276 000
Missour	347 000	North Carol na	248 000
Minnesota	264 000	Georgia	224 000
Iowa	242 000	Tennessee	205 000
Nebraska	236 000	Alabama	190 000
Wisconsin	224 000	South Caro na	151 000
Oklahoma	213 000	Texas	139 000
Kansas	206 000	Kentucky	136 000
Illinois	180 000	Arkansas	135 000
Kentucky	177 000	Lou s ana	117 000

How the Horse Developed

A horselike creature called an *Eohippus* ate the leaves of close-growing plants in America some 55 million years ago It was about the size of a fox terrier and had four toes on its front feet and three toes on its rear feet (*see* Prehistoric Life)



The zebra is also a relative of the horse It developed in Africa The zebra has never been tamed for domest c use

The *Mesohippus* of about 25 m llion years ago had three toes on each foot of these the center toes had grown longer and stronger because the Mesoh ppus ran only on them The *Merychippus* was the name of a still later development It was the s ze of a small pony and had hoofs really thick toenails on its middle toes Its other toes were so small that they no longer touched the ground

The next stage was the *Pliohippus* The small toes had so decreased that they were only thin bone splints attached under the skin to the bones of the center toes The *Equus* the true horse developed from the Pliohippus during the Ice Age (*see* Evolution Foot)

It is generally believed that about 5 million years ago horses migrated by way of a land bridge now covered by the storm tossed waters of Bering Strait that connected Alaska and Asia For some reason horses d ed out in America In Asia they multiplied and spread to Europe and Africa Horses did not re-appear in America until they were brought by Span iards The scientific name for the present-day horse is *Equus caballus*

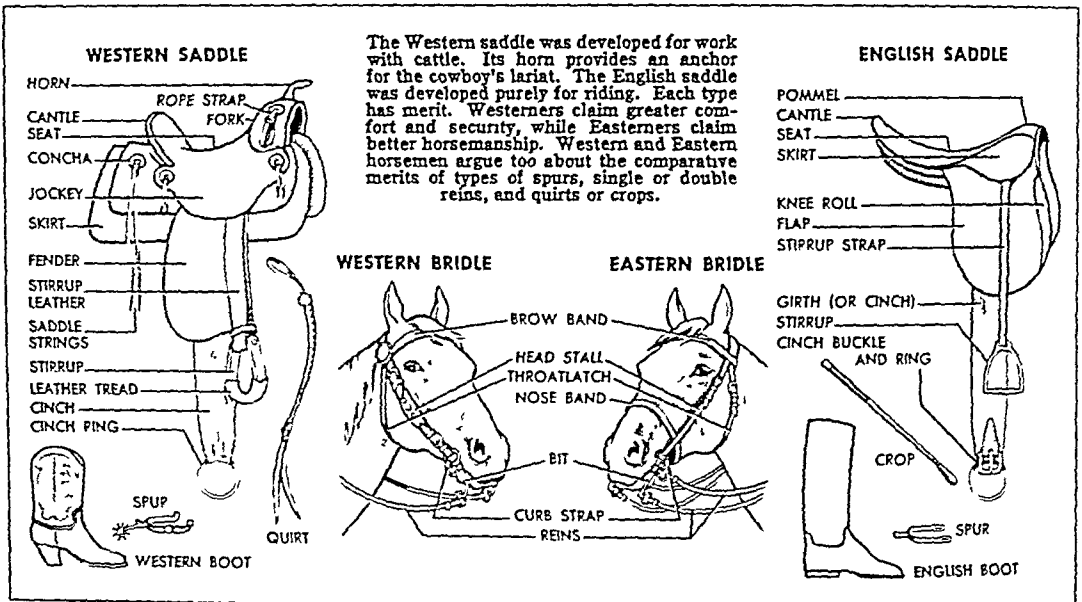
In Asia and Africa the species called ass developed from the Equus In Africa only did the zebra species develop (*see* Zebra) Asses were used as burden car riers by men long before the horse was generally used

How to Train a Horse

Horse lovers claim that a horse is just as much an individual as a human being So they say one must get to know a horse s traits before beginning its train ing All horsemen agree that the trainer should move slowly and handle the foal gently but various ways of training are favored The way the famous K ng Ranch of Texas trains horses is told here

A foal is handled before it is three months old so that it becomes accustomed to men By the time it is three months old it is introduced to a hackamore or halter to which a lead rein has been attached The trainer teaches it to follow a lead by pulling gently on the lead rein and to obey signals by drawing its head first to one side and then to the other The trainer rewards the foal with a carrot or an apple when it obeys Sugar as a reward is frowned on by many trainers In six to e ght half hour lessons a foal will learn to follow a lead rein

The foal is then taught to stand as its foot is lifted (as though it were to be worked on) If the foal struggles the foot is set down and the frightened animal petted the foot is lifted again within a few minutes however The foal s tra ning stops during its



first winter, but now and then its trainer feeds it hay and grain from his hand to remind it that he is its friend.

Training the Yearling

When training begins the next spring, the foal, now called a yearling, is reminded of its first lesson by being led. It is then bridled. After it is accustomed to the bridle, a blanket is slipped on and off its back. Only after it is familiar with this is a saddle put on and the cinch strap fastened loosely under its belly.

The yearling is led until it is at ease with the burden. Then the cinch is tightened. The trainer carries on with the leading lesson for another quarter of an hour. Next, after the bridle reins are tied so that they will not swing, the trainer permits the yearling to trot and canter as it wishes. This freedom accustoms it to the feel of bridle and saddle, the bump of stirrups, and the sounds of creaking leather.

The yearling's first rider should weigh not more than 90 pounds. Under the rider it is again led for a short time. Then the rider guides it. It is encouraged to trot only after it has learned to respond to signals at the walk. At this stage the yearling is slowed, turned, trotted, and halted several times. While halted, the rider dismounts and mounts four or five times. The lessons should be for half-hour periods only. After it becomes thoroughly familiar with and obeys commands, the yearling is turned free in pasture until it reaches two and a half years.

When training resumes, the young horse is again accustomed to hackamore, bridle, blanket, and saddle. It is then mounted by an average-weight man and, at a walk, is turned about and guided through several figure 8's. In the first half-hour lesson, the rider mounts and dismounts several times. During the succeeding lessons, the horse is trotted and cantered. After several such lessons the young horse is sufficiently trained so that it can be ridden by a rider of ordinary ability.

How to Care for and Feed a Horse

The proper care of a horse requires regular times for feeding and watering. It also demands more work, time, and patience than other pets. A horse's fitness depends upon proper food, care, and exercise. Its stall should be clean and well-bedded with straw, wood sawdust, or shavings. Its hay foods should be mixtures of timothy and alfalfa. Some clover may be mixed with these. Heavy oats are the best grain food, and ear corn also can be fed. To avoid respiratory troubles hay and grain must be free from dust.

A horse is fed about one pound of grain and one and one tenth pounds of hay per day for each hundred pounds of its weight. It needs some salt and a great deal of water, but it should neither be fed nor watered while heated by exercise. A good rider cools his horse out by walking it the last mile to the stable. An hour or so a day of grazing on good pasture is beneficial.

Grooming and Shoeing

Mud can be loosened from a horse's coat with a rubber currycomb and a fiber brush. Necessary grooming includes a daily vigorous brushing with a bristle brush. This cleans hair and skin and stimulates the skin glands.

A horse needs either to have its shoes reset or new shoes every four or five weeks. In winter its shoes should have steel calks that will bite into snow or ice. A good rider will not push his horse faster than a walk or jog on frozen ground, but on moderately packed snow it can be ridden at a fast trot or even at an easy canter.

Before and after a ride a horse's feet should be examined and cleaned. Stones, pieces of metal or wood, and other foreign objects may be picked up by

the hoofs These can be pulled out with a foot hook or any dull pointed metal piece

How to Ride a Horse

There are two well known styles of riding—the Eastern and the Western The Eastern style saddle is small and the stirrup leathers usually are medium in length The Western style saddle is large usually with long stirrup leathers and has a horn atop the pommel Both styles of riding can be learned only by practice The first lessons should be under supervision A quiet horse should be chosen one that will halt of itself if the rider loses his balance Balance is maintained by the rider gripping the saddle leather firmly with his thighs knees and calves The walk is quite fast enough for the beginner After a few lessons the beginner may ride at the trot

Posting is learned at the trot This is the controlled rise and fall of the rider s body in time with the horse s movements Its purpose is comfort to the rider and to ease the burden on the horse In the Western saddle, the rider flexes his knees and ankles in time with the horse's movements

Big cities maintain riding paths through their parks for followers of the sport Riding facilities are available in both city and country and it is almost certain that one can find them in his own locality A number of fine books on horses and riding appear in the bibliography with the article on Hobbies

How HOSPITALS *Give* EXPERT CARE *to the Sick*

HOSPITALS The modern hospital is first of all a place for skilled scientific treatment of the sick It is coming more and more to be a medical center, where doctors send patients for examination and diagnosis as well as for treatment Finally the larger modern hospitals are training centers for young doctors and nurses Some of them are also research centers where new drugs, surgical procedures, and treatments are developed

The United States has nearly 9 000 hospitals They range in size from modest establishments with a dozen beds and a single doctor to huge medical centers with 1 000 or more beds and hundreds of doctors nurses and trained employees About half the nation s hospital beds are in *voluntary* hospitals These institutions are governed by groups of men and women who serve voluntarily without pay Many voluntary hosp tals are owned by or affiliated with churches Others are operated by citizens to provide hospital care for their communities The voluntary hospital does not make a profit for its owners The money it receives from patients who pay is all used in providing service Some hospitals are operated as profit-making businesses, usually by groups of doctors who wish to provide luxury service for their patients

About half of the hospital facilit es in the United States are provided by various branches of the government The Veterans' Administration of the Federal government operates a vast system for former members of the armed forces while the Army, Navy, and Air Force have hospitals for those on active duty The state governments also maintain hospitals most of them for patients with tuberculosis and mental diseases Such ailments require long periods of hospitalization and few families can afford the cost The state therefore provides the needed care Many county and city governments also maintain hospitals to provide care for the sick especially for those unable to pay

Organization of a Hospital

Supreme authority in mo t nongovernment hospitals is exercised by a board of trustees often called a governing board Under this board is a medical staff in charge of all the treatments and other professional work General management is usually entrusted to a single executive called the administrator director or superintendent

The *medical staff* consists of the doctors who are entitled to use the hospital and its facilities for treating patients Doctors are granted this privilege by the governing board upon recommendation by the staff members In some hospitals the staff consists only of doctors who share in the management and treat the patients which the hospital assigns to them Those who use the hospital only for treating their own patients are called *courtesy* members

Many Services Rendered by Nurses

All hospitals have the same basic departments and services The most fundamental service is nursing care Trained nurses represent the doctors 24 hours a day at each patient s bedside Each nurse keeps a chart of temperature and pulse rate for each patient in her care She also notes every significant detail about the patient s condition and reactions When a doctor ' makes rounds '—calls on his hospital patients, usually in the morning—a glance at each pat ent's chart gives him an up to-the-minute basis for deciding what may need to be done

The nurse must also keep each patient clean During "morning care ' she changes the bed linen and bathes her patient in bed If a patient is extremely ill or helpless she may have to feed him

Finally, the nurse carries out the doctor's instructions for medical care She changes dressings or bandages on a surgical incision or wound or assists the doctor in doing so She gives medicines by mouth or by injecting them with a hypodermic needle The nurse may have to set up an oxygen tent or the bottles and tubes which drip nourishment or drugs directly into the veins

In many hospitals, some simpler duties such as cleaning up the room making the bed carrying the bedpan, and feeding the patient, are performed by assistant nurses who have been trained only for this work Such an assistant may be called a practical nurse, nurse s aide ward helper or ward attendant

Each hospital floor, or corridor where patients' rooms are located, has a central nursing office called the nurse's station Usually it is near the elevator

and service rooms and at an angle to the corridor. From this station, the head nurse controls the care of all the patients in her charge. A single station may supervise from 15 patients to as many as 40 or more.

Rooms, Wards, and Food Service

The growing complexity of hospital care and the growing desire of patients for privacy are leading hospitals to change from wards for 10, 12, or more patients to more private and semiprivate rooms for one, two, three, or four patients. Only in a few of the largest government hospitals is the huge, open ward for 50 or 60 patients retained.

An exacting task is that of serving three meals a day to people in bed who are ill and often critical of their food. Also, from 10 to 30 per cent of the patients may require special diets to suit their conditions. Kitchens and food-service departments are directed by the head dietitian. In a large hospital, this person has had many years of special training and may have a staff of assistant dietitians. The actual work requires cooks, butchers, bakers, tray girls, maids, and dishwashers.

In many older hospitals, food is prepared in a central kitchen. When ready it is placed in bulky containers, then carried in heated carts to serving kitchens on the hospital floors. There it is served, into dishes, placed on trays, and carried by maids to the patients. Most newer hospitals, however, use *central tray service*. Under this plan, the individual trays are made up in the central kitchen. Dishes are covered so hot food will remain hot and cold food will remain cold while the trays are being delivered.

Operating Rooms and Other Professional Services

Nearly half of the patients in the average hospital need some kind of surgical treatment. The operating-room suite or floor is the place where this is done. In older hospitals, the operating rooms are located on the top floor, where they can more easily be kept free of dirt and dust and where big windows give the greatest amount of light. Today special lights and forced-draft ventilation and air-conditioning equipment make it possible to locate the surgical suite on any floor.

Outside the operating room or every two operating rooms is a scrub room. Here doctors and nurses on the operating team scrub their hands and arms free of germs, then put on newly sterilized gowns, caps, and masks to avoid infecting patients with germs. All the instruments and materials used by the surgeon are sterilized in steam tanks. Operating-room floors are made of special conductive material which carries off static electricity. This is important, because many anesthetic gases are explosive.

The delivery rooms where babies are born are planned like operating rooms to avoid infection. All materials are sterilized, and everyone coming into the delivery-room area must be scrubbed, gowned, and masked. The same rules apply in the nursery for newborn infants. Visiting is carefully regulated to prevent outsiders from bringing in infection. Even the new father may be allowed to see his baby only through a glass window in the nursery.

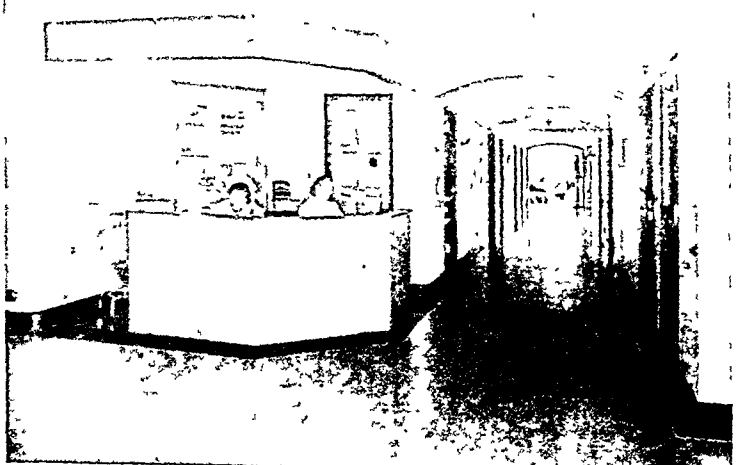
Some new hospitals prefer a "rooming in" plan for newborn babies rather than the large nursery. The babies are kept in cubicles adjoining their mothers' rooms instead of in a large central nursery.

In many hospitals a *casualty* or *emergency* department has one or more nurses and interns who are always ready to receive victims of accident and sudden illness. They give first aid and prepare the patients for emergency operations or treatment. Many hospitals also maintain a *clinic*, or *out-patient* department. Here patients are cared for who need treatment but not hospitalization. Some hospitals give service to the underprivileged without cost or for low fees.

Many patients in a modern hospital come for examination rather than for treatment. The hospital laboratories make needed tests and studies. The chief of the laboratory department is the hospital's pathologist. He is a doctor who specializes in identifying diseased conditions in tissues and body fluids. He rarely sees patients himself, but he is concerned with nearly every case, through the tests he makes.

Another important service is provided by the X-ray department, conducted by specialists called roentgenologists. They take photographs and also use the fluoroscope to view the

A CONTROL CENTER FOR NURSING CARE



From this nurse's station, the head nurse for the area supervises the care of patients. Charts and notes for each patient are kept here and a medicine cabinet holds the floor's stock of drugs. Each patient can call for a nurse by pressing a button near his pillow. Immediately a light flashes on over his door and a signal is given at the station.

body's organs as they function (*see* X-rays) The X ray department also has equipment for treating certain tumors and growths Similar treatments are given with radioactive materials prepared by the machines used for atomic fission (*see* Atoms) Use of beams from some of the machines is being developed

An important diagnostic aid is the basal metabolism machine It measures the rate at which the body absorbs and uses foods The electrocardiograph is used to make records of heart action

Hospitals as Medical Centers

Provision of such elaborate equipment draws medical care increasingly to hospitals Few doctors in offices have the equipment to make the tests needed in modern medicine But a hospital can provide the expensive equipment and the services of specialists because it can spread the cost over many patients

The presence of experienced doctors on the hospital staff makes many hospitals training centers In smaller hospitals, young doctors learn by observing and working with those who have had more experience Larger institutions have a formal teaching program Young graduates of medical school spend a year or more in the hospital as interns or resident physicians In these positions they perform routine medical duties for staff members and work with older men in caring for patients

Many hospitals also have schools of nursing open to girls who have graduated from high school They learn by study in classes and by practical experience (*see* Nursing)

Problem of Providing Hospital Service

As the hospital has become more complex, it has naturally become more costly to build and maintain The modern hospital must have expensive drugs, equipment, and materials, and a large one needs many trained people Usually there is more than one employee for each patient As a result it costs about $12 a day for every patient in the hospital

As hospital care became more costly, insurance plans were developed to help people pay their hospital bills An individual pays small sums every month for himself or his family into a common fund The fund pays hospital bills for all subscribers The largest membership—nearly 40 million in the United States and Canada—subscribes to Blue Cross plan

Management of a modern hospital requires a detailed knowledge of many different fields of work Every large hospital has an executive staff of highly trained men and women About 12 universities in the United States and Canada offer special graduate courses in hospital administration

Long History of Hospitals

Hospitals of some sort have been known since early times In ancient Babylon people brought the sick to the market place and left them there, not only for shelter but so that passers-by could observe their ailments and suggest treatments India had shelters for the sick thousands of years ago Egypt had temples of healing where the sick were treated by prayers, charms herbs, and drugs

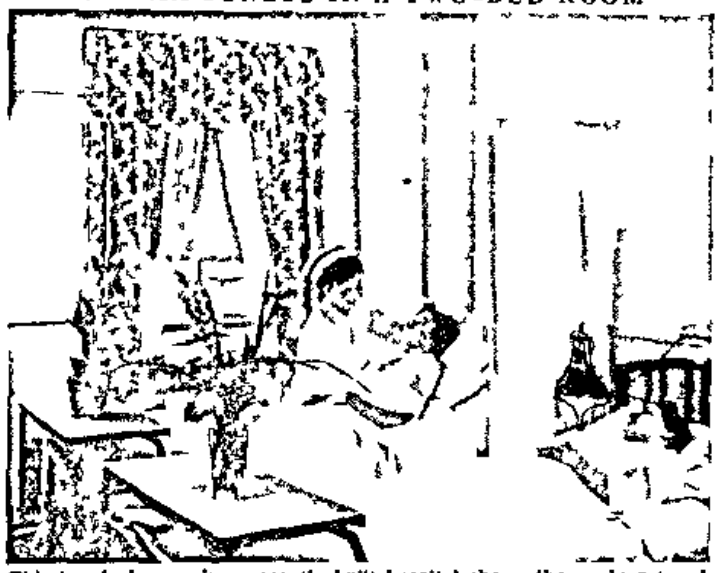
The ancient Greeks also had temple hospitals, named after Aesculapius the Greek god of medicine One of the most famous was at Cos, an island in the Aegean Sea Here Hippocrates, the Greek physician who is known as the 'father of medicine," practised his art 400 years before the birth of Christ

One of the greatest hospitals of the early Christian Era was founded by St Basil at Cappadocia in Asia Minor Another famous hospital of religious origin is the Hôtel Dieu of Paris France It was founded in A D 660 and while it has been moved several times, has been in continuous service ever since During the Middle Ages, many orders of hospital workers were formed Among them were the Knights Hospitalers of St John which was founded during the Crusades the Alexian Brothers, and the Order of St Lazarus of Jerusalem.

The care given in these hospitals was poor by modern standards Two patients or more often shared the same bed and beds were crowded together in huge halls Efforts were made to keep the patients clean and their clothes laundered, but patients commonly caught infections from one another

The first hospital in the United States was founded at Philadelphia in 1751 Benjamin Franklin helped organize it, with funds obtained from the city government and several wealthy citizens The first building is still in use today In America as well as in Europe however, hospitals remained mere shelters to care for those too poor to be treated at home until rapid growth of scientific knowledge about disease in the 19th century changed conditions (*see* Medicine and Surgery) Today hospitals have the finest service and the most up-to-date scientific equipment

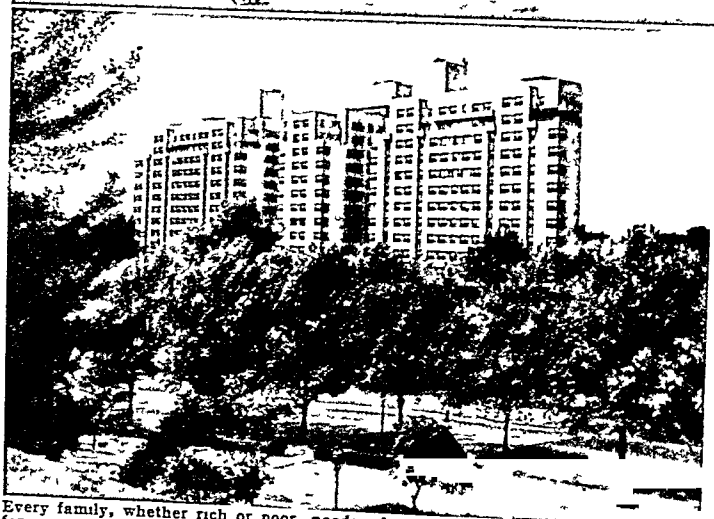
CHEERFULNESS IN A TWO-BED ROOM



This two bed room in a recently built hospital shows the modern trend toward attractiveness Until recent years curtains and other ornaments were banned because they might harbor germs and dust But this gave a bleak appearance which depressed many patients Today ways have been found to avoid former dangers while adding needed cheerful touches

Providing HOUSING *for America's* MILLIONS





Every family, whether rich or poor, needs adequate housing This is true on the farm, in small towns, or in large cities Adequate housing need not be luxurious It may be as modest as the neat Midwestern farm (upper picture) or it may be as costly as the modern Philadelphia apartment building (lower picture).

HOUSING. One of the great national problems facing the United States today is that of providing enough good homes for its people. Housing has become a grave problem only in recent years. In colonial times land was cheap or even free. Pioneer settlers could build homes almost anywhere they chose. They could get wood, stone, and earth by cutting or digging, and they knew how to do the building themselves.

During the 19th century these conditions gradually changed. As the nation became more thickly settled, less free land was available. In the cities, desirable land became expensive. Also, an ever larger portion of the population earned its living at full-time jobs in factories, offices, and stores. These workers had no time to build houses, nor did they know how. They had to buy or rent their housing.

The type of household equipment also changed. As the century passed, city houses came to have gas and later electricity for lighting and cooking. Plumbing for running water and sanitary facilities became common. All this made houses more comfortable and healthful, but also more expensive to build.

Rising costs were met in part by the development of *rental* housing Such housing consisted largely of *multiple-unit* dwellings—that is, homes for several families in the same structure. This type of building reduced the construction and maintenance cost of each family unit Thus many families could rent apartments or flats for less than they would have to pay each year for buying and maintaining their own houses.

Rental property provided good housing for most city families One exception was families on the lowest income levels—particularly immigrants who crowded into the cities and earned barely enough to maintain life. The only rental property they could afford was dilapidated housing in old, run-down neighborhoods called *slums*. Low-income families in country districts were also forced to use dilapidated housing; but their plight was less noticeable, because the dwellings were not in crowded areas.

For a short time during and after the first World War, a shortage of housing developed. But a building boom in the 1920's produced more than 700,000 dwelling units a year, in cities and towns. On farms the production of new homes lagged because farm income remained low; but on the whole, building did not slacken until economic depression struck the nation, beginning late in 1929.

Thereafter construction slumped to an average of about 275,000 dwelling units a year. This was not enough to house the new families added to the population each year; and it provided no replacement for worn-out or destroyed units. Also, countless dwellings deteriorated rapidly through lack of repairs.

The second World War added immensely to the mounting shortage. The government channeled most housing materials into the war effort, and construction workers went into war industries or the armed services. After the war, returning veterans and a huge increase

in the number of new families brought the need for housing to a crisis Comparatively few veterans could find the type of home they wanted In many cases two families lived in a dwelling unit suitable for one A survey by the Census Bureau showed that perhaps as many as 1½ million doubled up families wanted separate homes

New construction could not catch up with demand and high building costs added to the problem A commonly used test of 'ability to pay' says that a family can afford to pay 2½ times its annual income for a home (the payment being spread, of course over many years) If the home is rented, a family should spend no more than 20 to 25 per cent of its income for housing On the basis of these tests much of the new home construction had to be sold or rented at prices which millions of families could not afford The problem was complicated further by lack of agreement about the extent of need and about the kinds of housing necessary to remedy the acute shortage

What Is Adequate Housing?

ONE accepted starting point for estimating the extent of the housing problem is to determine how many homes are *adequate*—that is, how many dwellings offer the shelter, conveniences, and healthful conditions necessary for desirable family living

Minimum requirements for an adequate home vary widely in different parts of the nation A home in Florida or southern California requires much less heating equipment than does a home in regions where winters are severe Ample fresh air and sunlight are a problem in cities but not on farms On the other hand most city dwellers can have running water by turning a faucet but many farm families must obtain their water from a well

These varying requirements make it difficult to devise any countrywide test of adequacy Probably the most commonly used tests are those which have been developed by federal housing agencies and authorities They include six major requirements as follows

1 Houses or apartments should not cover more than 30 per cent of the land This is to insure space for light and air and playgrounds for children

2 Each dwelling unit should contain a living room, kitchen, bathroom, and ample storage space A family of four should have at least two bedrooms, a family of six at least three and so on

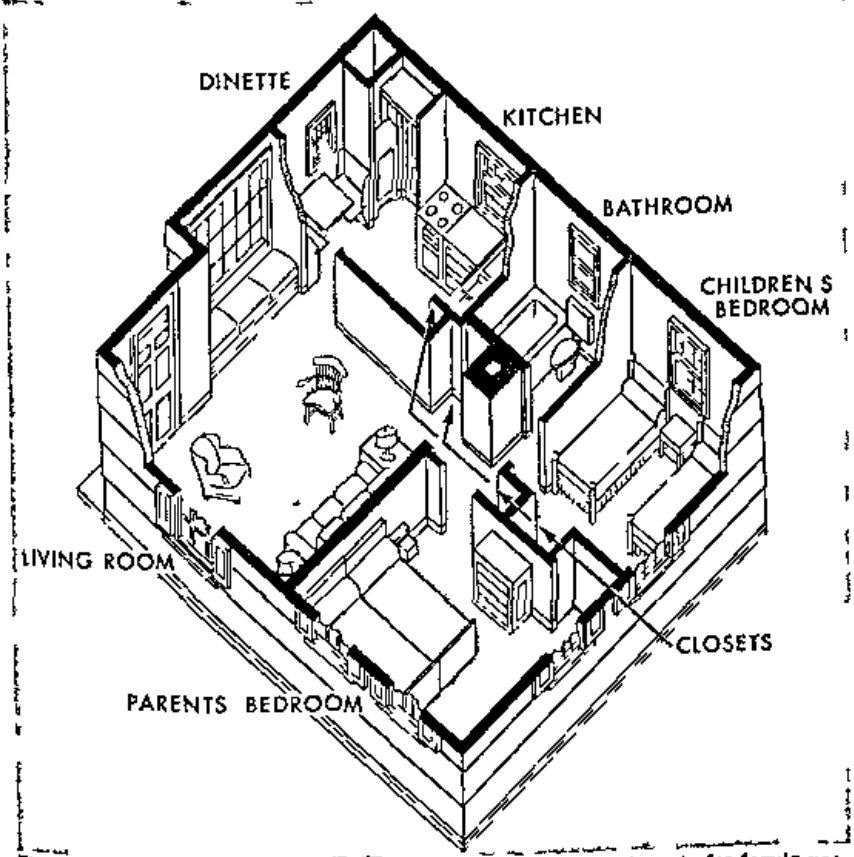
3 Living rooms should contain at least 150 square feet, bedrooms 110 square feet and kitchens (including dining space) 90 square feet Each of these rooms should have an outside window

4 Every home should include facilities for toilet, bathing, cooking, refrigeration, hot and cold water, electric lighting, garbage disposal, *and heating where necessary*

5 The dwelling unit should be safely constructed, with a reasonable amount of fire protection

6 The homes should be located in a favorable neighborhood, away from industries and traffic hazards

WHAT AN ADEQUATE HOME SHOULD PROVIDE



This view suggests facilities that are needed to make a home adequate for family use The dwelling unit (house or apartment) should provide space for cooking, eating resting and storing clothes Sanitary equipment includes a bath or shower and an indoor toilet (flush or chemical) No more than two should sleep in a bedroom

The Supply of Good Dwellings

Most of the nation's older homes were considered adequate at the time they were built But since then the standard of living has risen sharply Today an adequate home contains comforts and conveniences virtually unknown in a home erected 50 years earlier As a result many dwellings fail to meet modern standards

Some housing authorities say only about two out of every three American families live in homes that are adequate The 1950 census of housing showed that 75 per cent (about 9 million) of the nation's dwelling units were not "dilapidated" and had the standard plumbing facilities—private toilet, bath, and piped running water

Other authorities say that the percentage of adequate homes is still higher, at least 88 per cent They cite the increasing

proportion of houses equipped with electric lighting, running water, and private cooking, bathing, and toilet equipment.

Under any test, however, an important part of the existing housing would not qualify as "adequate." Beyond this stood the plain fact that the total number of homes, both good and poor, was far short of the need. Moreover, adequacy tests and physical shortages do not take into account still other aspects of the housing problem.

Problems Created by Slums

PROBABLY the most serious housing problems arise from the existence of slums in cities, towns, and even rural areas. During the 20th century, communities and the nation at large began realizing more and more clearly that slum living was not merely a problem for the slum dwellers themselves. It became accepted that a slum creates economic and social losses that affect every member of the community.

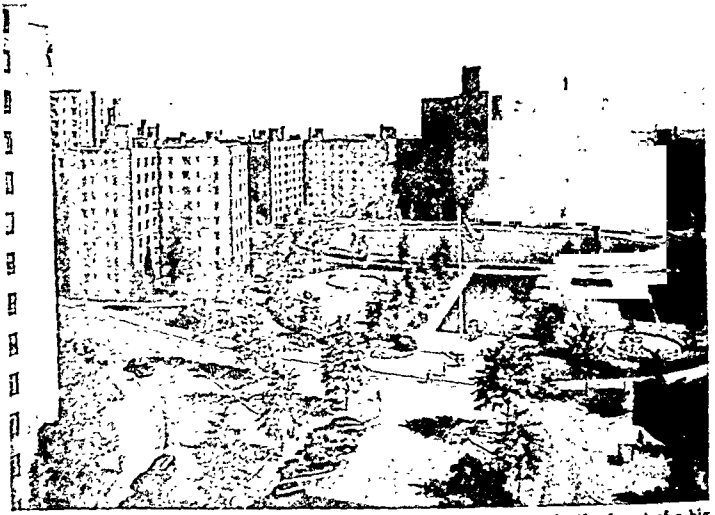
These widespread effects can best be understood by starting with the question, "What *is* a slum?" Congress has defined a slum as an area in which most of the buildings are detrimental to safety, health, or morals. This may be caused by dilapidation, overcrowding, faulty arrangement, or lack of ventilation, light, and sanitation facilities.

The Nature of Slum Living

Many slums occupy what once were good residential neighborhoods. As the automobile and interurban transportation developed, the original residents moved to the city's outskirts or to the suburbs. Their homes were divided up into rooming houses and apartments for families of lower income. New houses and shops of cheap construction were built on most of the vacant land, shutting out sunlight and ventilation.

As many as ten or twelve people crowded into three- or four-room flats. Some of the rooms—usually bedrooms—had no windows. One hall toilet might serve 25 or 30 people, or the toilet was in the back yard. Lacking repairs, the buildings quickly became worn-out, dirty, and infested with vermin. Children had no place to play except in the

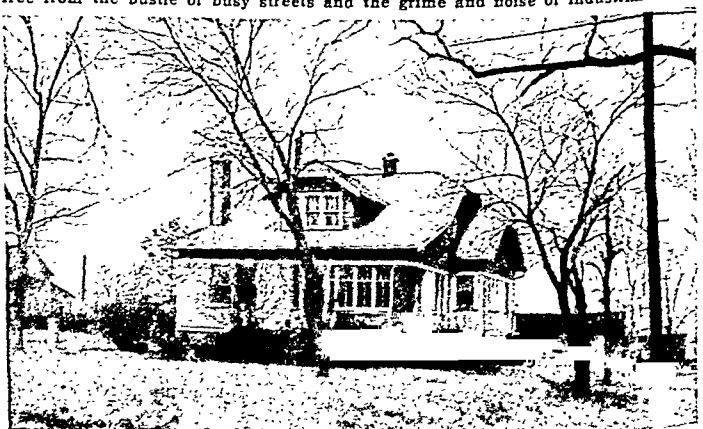
WHERE SOME AMERICANS LIVE



Proper planning can produce comfortable, pleasant homes even in the heart of a big city. Parkchester in New York City has this large area where children can play safely.

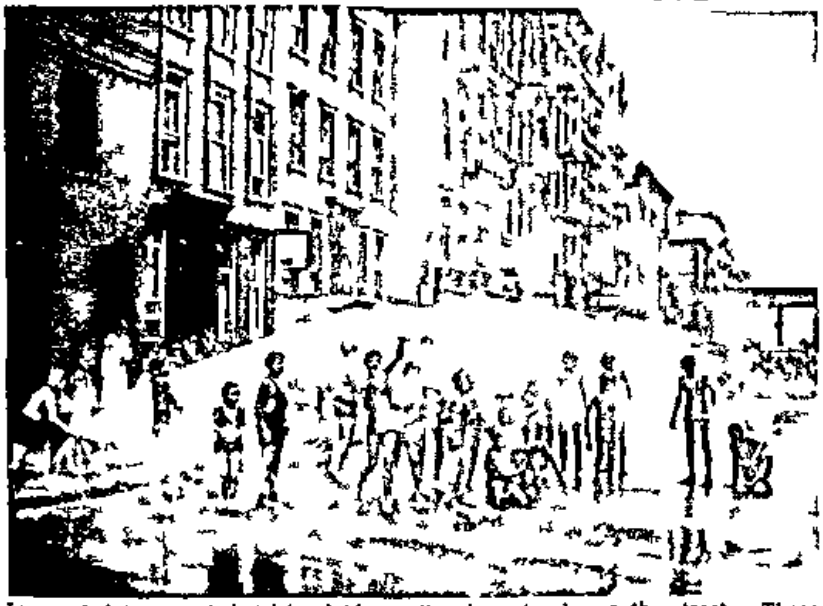


Cities of every size have quiet, attractive residential neighborhoods. They are free from the bustle of busy streets and the grime and noise of industrial areas.



The countryside is dotted with many of these neat, roomy farmhouses. Such homes provide an abundance of fresh air, sunlight, and playground space for children.

WHERE OTHER AMERICANS LIVE



In crowded tenement d stricts ch ld en often have to play n the streets These New York children have turned on a water hydrant to get cool on a hot summer day



This street corner is typical of many o d res dent al ne ghborhoods P aces of busi ness have been started in an area already crowded w th weather beaten homes



Some farm lands cannot support adequate homes A house such as the one shown here does not even provide a minimum level of healthful and comfortable shelter

streets and alleys In 1948 a joint Congressional housing committee reported that approximately a fifth of the urban population lived in such slum areas

Effects upon Community Health

The lack of sunl ght and ventila- tion in c ty slums makes their in habitants an easy prey to disease Inadequate sanitary facilit es over crowding fl es and vermin help spread disease rapidly through en tire areas Old and d mly lighted stairways and halls also produce a high accident rate in the home

New York City compared the d sease death rates of famil es who lived in substandard homes with families of the same income group who lived in good housing In slum areas the death rate was almost twice as high for tuberc losis diph theria typhoid fever and sp nal meningitis Figures from eight cities showed that in fam lies averaging two or more persons to each room the infant death rate was 2½ times higher than for fam lies who averaged *less than one person to each room* In one city fires in the worst tene- ments cause l four times more deaths than in better constructed though equally crowded buildings

Authorities in Newark N J stud ied the effect of housing on a group of families that had moved from sub- standard to adequate homes Over a two-year period the rehoused families had

45% fewer cases of tuberculosis
15% fewer infant deaths
31% fewer cases of children s diseases
74% fewer fires

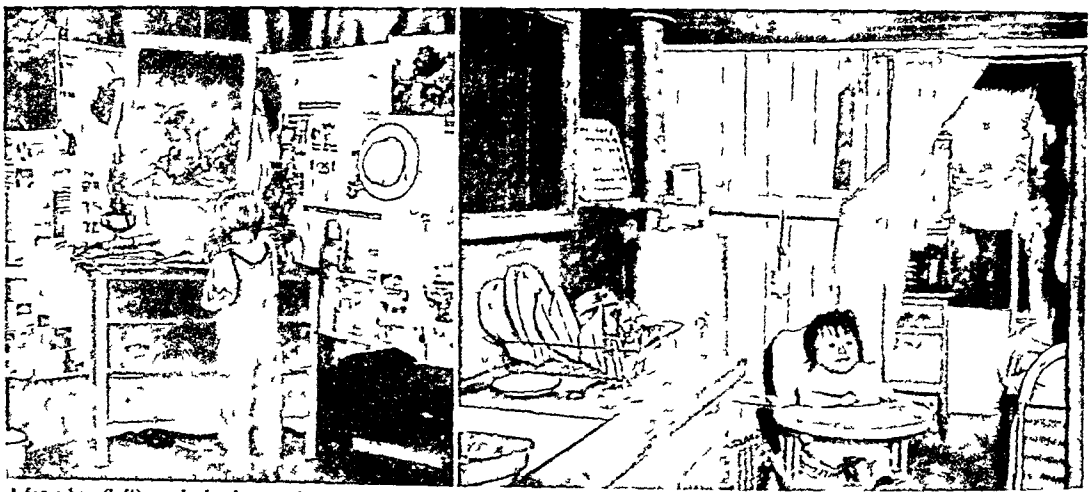
Poor housing in rural areas is also *injur ous to health Lack of sanitary* toilet facilities is one of the greatest sources of disease on farms The United States Public Health Service reported that typhoid fever was 73 per cent higher in dwellings that had no private inside flush toilet

Effects on Delinquency and Crime

Juvenile delinquency cannot be as- cribed to any one influence But it seems clear that quality of housing is a definite factor

A Chicago study found that the number of truants from slum areas was more than twice the city average and the percentage of juvenile de linquents from slum areas was 2½

POOR HOUSING HANDICAPS MANY CHILDREN



A farm boy (left) combs his hair in the only bedroom in the house Newspapers tacked on the wall help keep out the cold The little girl's home (right) in a big city is too crowded for comfort Only curtains separate the kitchen from the bedroom

times higher On the other hand, in Newark, juvenile delinquency rates dropped 21 per cent among families who moved from slums to good housing elsewhere.

Crime records indicate the same results. Studies from several cities show that on the basis of population the crime rate in slum areas was two to three times greater for larcenies, robberies, and murders

The High Money Cost of Slums

Statistics cannot accurately measure the huge cost of slums in terms of ill health, broken homes, juvenile delinquency, and crime. But the money costs for fire, police, and public health services can be closely estimated In Los Angeles, certain slum districts occupy 2 per cent of the city area and contain 15 per cent of the population Yet these districts cost one-third of all the money spent each year for public health and for law enforcement.

In Buffalo, N Y , a study showed the average annual cost for each family in slum areas as compared with the city as a whole:

	Slum Area	City Average
Police protection	$ 27 16	$ 19 19
Fire protection	35 79	15 40
Juvenile delinquency	60	25
Public health services .	52 56	15 52
Public welfare services	224 01	89 50
	$340 12	$139 86

At the same time low real estate and building values in slum areas cut drastically into tax revenues Chicago found that it collected an average of $4 25 a year from residents of slum areas; and $11 30 a year from inhabitants of better neighborhoods Thus the low revenue from slum property must be made up by every other taxpayer in the city.

GOOD HOUSING HELPS PRODUCE GOOD CITIZENS



This boy (left) has to stand on tiptoe to see his image in the mirror. But the bathroom in his home provides all the necessary sanitary facilities In a large, bright kitchen (right) a young girl helps her mother put away the breakfast dishes.

Slums are not confined to large cities According to one study only 19 per cent of American slum areas were in cities of 500 000 population or more About 23 per cent were in cities of 100 000 to 500 000 and 58 per cent were in cities with less than 100 000 population

In 1948 a congressional committee reported that 'substantial improvements in farm housing conditions are needed' A Census Bureau report had disclosed these conditions for farm homes

- 9 9% had more than 1½ persons to each room
- 15 5% needed major repairs
- 36 7% had no electric lighting
- 64 6% had no running water

While such farm dwellings are not usually called slums "they may be just as harmful to safety health and morals as poor city housing Fortunately however, there has been some improvement in the condition of farm housing since 1948

Decay in Neighborhoods

HOUSING is constantly being impaired by changes which threaten to produce future slums These changes arise from the fact that many American cities grew and expanded without careful planning

The general tendency always has been to erect new single-family dwellings—that is *houses*—on vacant land farther and farther from the heart of a city This costs much less than constructing new dwellings in built-up neighborhoods It also provides an escape from city noise, dirt, and congestion The outward shift was made possible by steady improvements in transportation

Meantime, if an older neighborhood had particular advantages, most houses were kept in good repair, others were replaced with good or high quality multiple-unit dwellings In other areas housing and property values began to deteriorate Perhaps factories had entered the neighborhood or other changes had taken place that made the area less desirable Then the existing housing simply grew older year by year and was worth less either in a sale or as rental property

At the same time, declining property values failed to stimulate the construction of new housing in the neighborhood Once this stage was reached the area was said to be *blighted* When blight became noticeable the neighborhood usually deteriorated more and more rapidly Unless the causes of blight were removed and the area rehabilitated it eventually became a slum

Until after the first World War, communities paid little attention to neighborhood blight In the 1920's, however, the loss of tax revenue from such areas became serious, and the problem was made more pressing when all property values slumped in the economic depression of the 1930's The second World War blocked most public and private attempts to rehabilitate the older neighborhoods But in the postwar years many communities as well as private builders constructed better planned housing in old as well as in new neighborhoods

Effects of Racial Restrictions

A factor in producing some city slums is the practise of restricting Negroes, Mexicans, Asiatics and other racial minorities to certain areas Formal agreements to this effect cannot be enforced by law, but property owners can simply refuse to sell or rent to members of these minority groups

As a result of segregation the racial districts soon become overcrowded For example in one large city, units built to house 1,127 families actually held 3 580 families and 646 roomers in addition Under such pressures the area almost inevitably becomes a slum

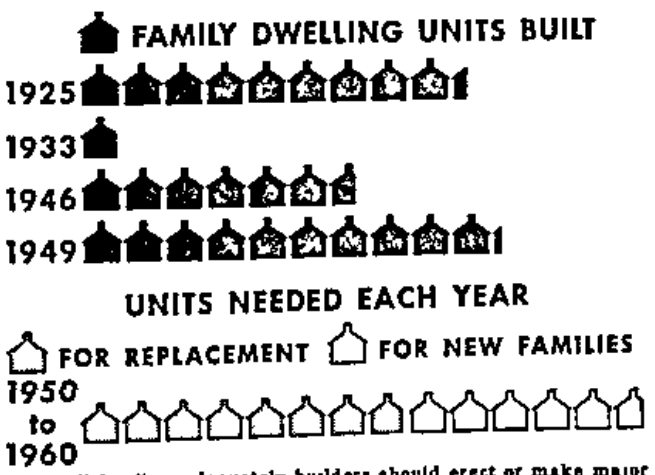
Future Needs

ESTIMATES of future housing needs of the United States vary because of differences of opinion as to how many houses need replacement or repairing and how rapidly this should be done The Federal Housing and Home Finance Agency estimated that from 1947 to 1960 the nation should build or rehabilitate 1,228 000 nonfarm dwelling units each year When this total was not reached in 1948 or 1949 the number of new or repaired units needed in each of the next ten years increased to 1 372 000 (*see* chart on this page) The government also estimated that during this period an additional 2 to 3 million farm homes should be built or rebuilt

In 1950 a record number of 1 396 000 new dwelling units were built Despite the demands of military rearmament in the years that followed, more than one million new units were started each year thereafter

A later section of the article explains what the nation communities and private enterprise are doing to help solve the problems of new construction, blight prevention, and slum clearance.

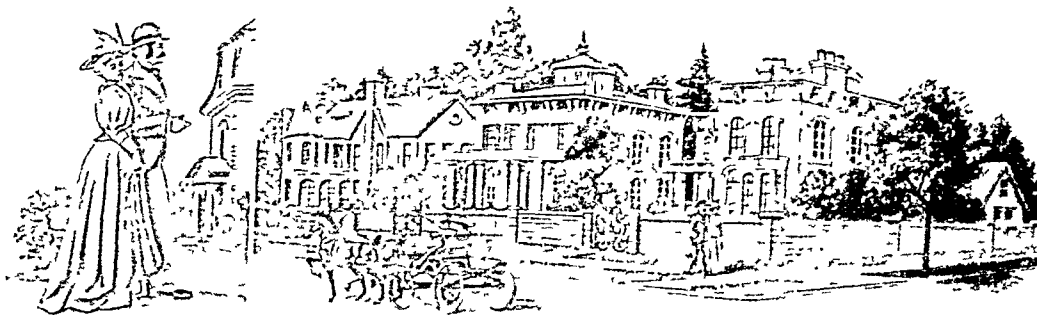
HOME BUILDING IN THE UNITED STATES



To house all families adequately builders should erect or make major repairs on 1 372 000 dwelling units every year for ten years Before the second World War the biggest year for new construction was 1925 the lowest 1933 In 1946, 671 000 units were built The mill on mark was first reached in 1949

HOW BLIGHT OVERTAKES A NEIGHBORHOOD

1 A residential neighborhood in 1890

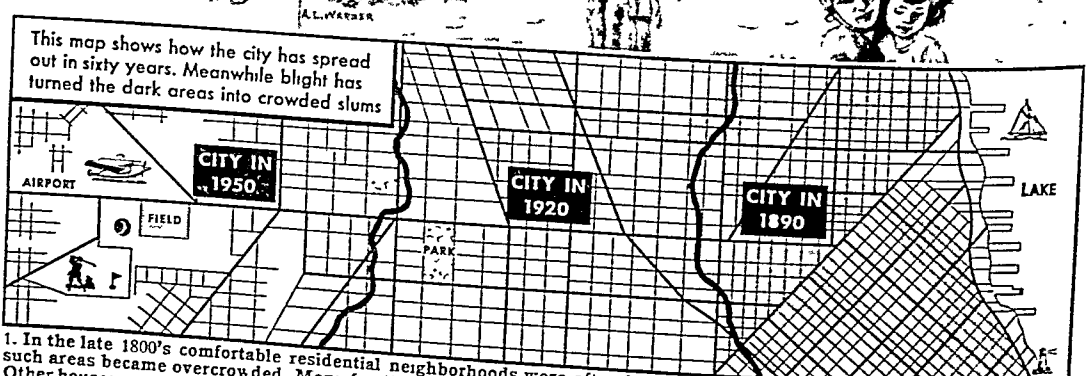


2 Thirty years later blight has set in



3 The same area is now an unsightly slum



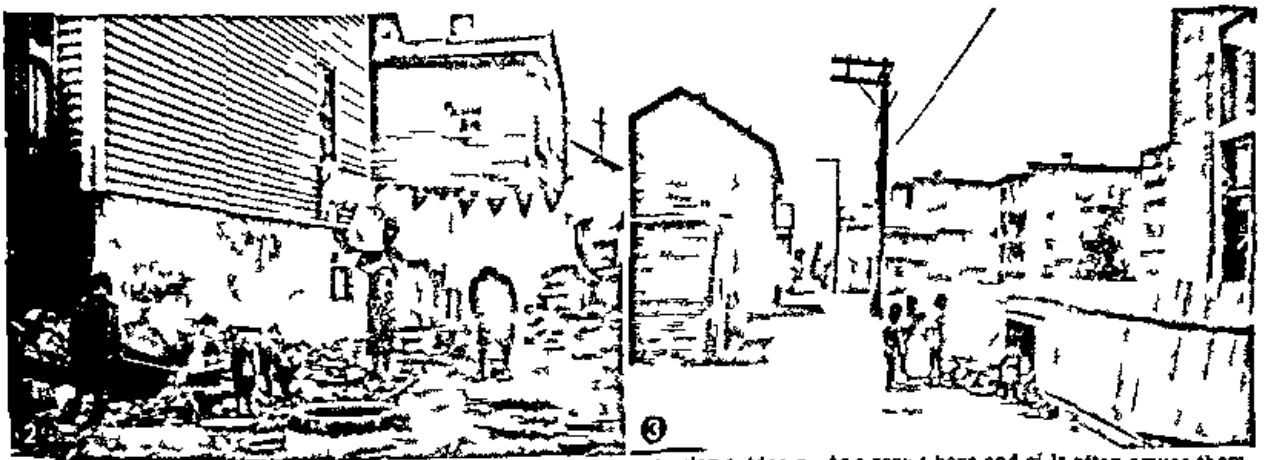


1. In the late 1800's comfortable residential neighborhoods were often located near the heart of a city. 2. By 1920 many such areas became overcrowded. Many families moved to outlying areas. Business houses took over some vacated homes. Other houses were cut up into cheap apartments and rooms. 3 By 1950 blight was complete. The neighborhood had become a slum. The map shows that while the city was growing, blight was eating away at its core.

A CLOSE LOOK AT FIVE BLIGHTED AREAS



1 Most American c ties have grown w thout any o de ly plan of deve opment As a resu t many ne ghbo hoods became a jumble of houses billboards stores and factor es Once th s state s eached rebuilding s difficu t and costly

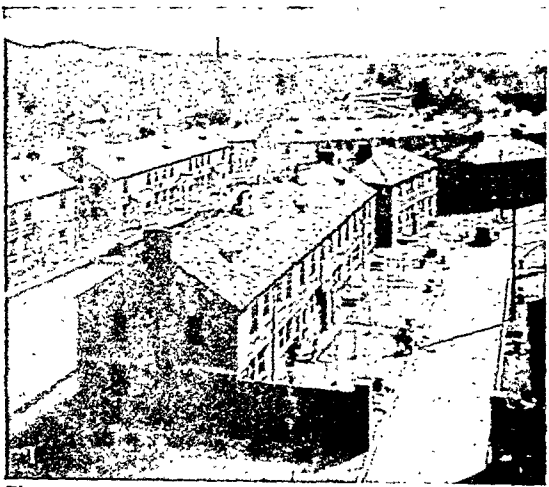


2 and 3 Overcrowded ne ghborhoods leave l tt e space for ch d en to play outdoo s As a resu t boys and gi ls often amuse them selves by search ng through trash in a vacant lot or a ey La ge scale community act on can p ov de better places to play



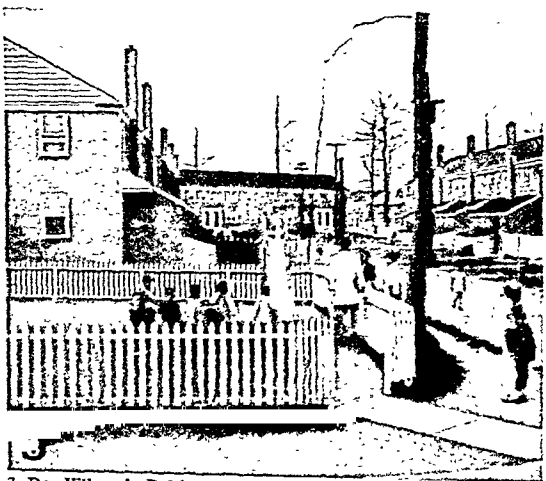
4 In bl ghted zones the inter ors of homes are o ten as cramped as the ne ghbo hood This family lives n a damp basement apart men wi hout a window 5 The on y ent ance to some homes n s um a eas is th ough back yards l ke those shown above

HOW BLIGHTED AREAS HAVE BEEN REBUILT





The comfortable homes shown here stand in what once were blighted neighborhoods. These redeveloped areas are: (1) College homes in Knoxville, Tenn., (2) Brooks Homes in Chicago. Each was a public housing project financed by federal and local funds.





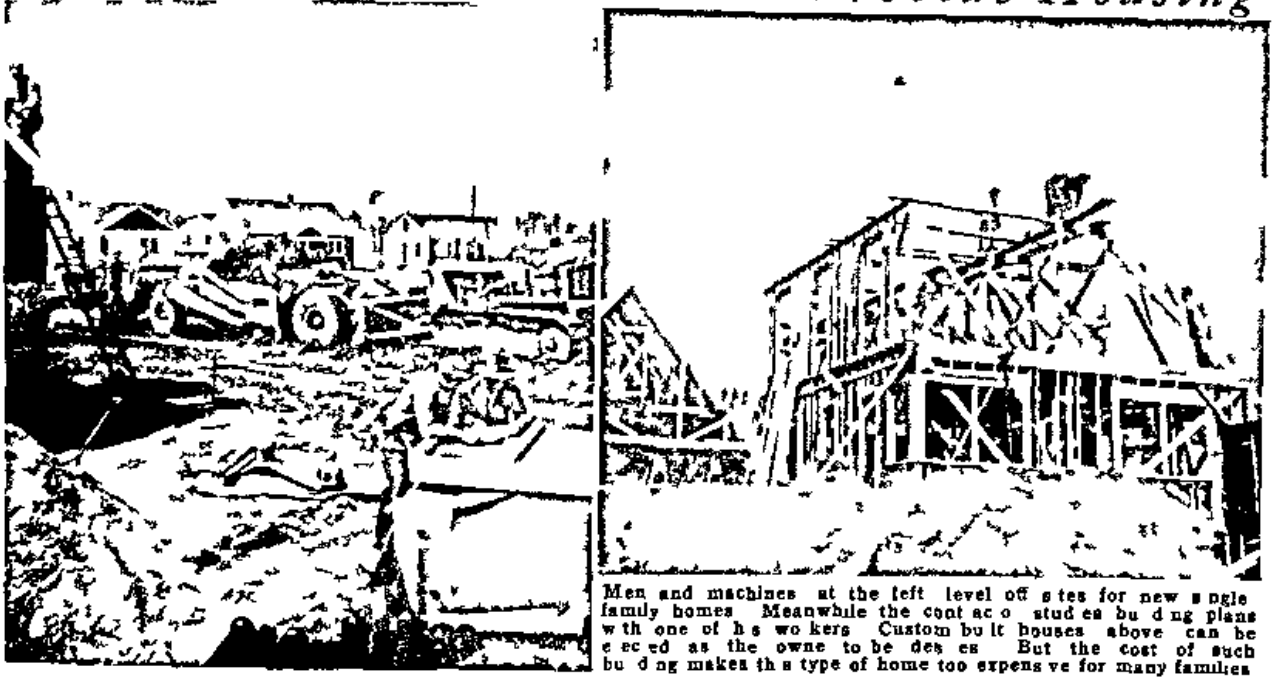
3. Day Village in Baltimore, Md., was built by private enterprise. The mortgage loan was insured by the Federal Housing Administration. 4. The Charles F. Weiler Homes in Toledo, Ohio, are a public housing project built for families with low incomes.





5. This is one of the units in the Benedict Courts, Columbia, S.C. 6. Here is a living room in the Holly Court project, San Francisco, Calif. Federal and local subsidies help pay part of the upkeep in both of these developments.

Private and Public Action to Provide Housing



Men and machines at the left level off sites for new single family homes Meanwhile the contractor studies building plans with one of his workers Custom built houses above can be erected as the owner to be desires But the cost of such building makes this type of home too expensive for many families

THE PROBLEM of providing adequate housing for all Americans is gigantic in every aspect After the second World War building activity was resumed on a large scale Beginning in 1949 more than one million new dwelling units have been started each year in the United States Many other units have been rebuilt Most housing experts however point out that constructing new and rebuilt homes is only a partial answer to the housing problem

Long experience has proved that an important factor in producing neighborhood blight has been lack of sound planning to provide light air playgrounds and parks and freedom from undue noise grime and traffic dangers In some neighborhoods blight has advanced to a point where many homes cannot be fixed up Here the entire area must be cleared and then replanned and rebuilt In other areas vigorous public and private action can remove the cause of blight and produce a pleasant residential neighborhood

Classification of Housing Supply

To determine the future housing supply authorities often classify neighborhoods according to how long the buildings may be expected to provide adequate accommodation The life expectancy of a building depends upon original soundness and how well it has been maintained Fifty years is often used as a average figure for the life expectancy of American housing On this basis neighborhoods containing homes of average construction and maintenance may be classified as follows

1 *New-growth areas* Most homes less than 10 years old should retain value for at least a generation

2 *Stable areas* Most homes from 10 to 25 years old under normal conditions of development should retain sale or rental value for many years

3 *Areas needing conservation* Most structures from 25 to 45 years old may need some improvement or reconstruction

4 *Near-blighted areas* A majority of homes substandard or more than 45 years old extensive replacement and neighborhood rehabilitation usually needed

5 *Blighted areas (slums)* A majority of homes substandard 20 per cent or more need major repairs or are unfit for use The only remedy is demolishing the buildings and rebuilding

ERECTING A FACTORY MADE HOUSE



Prefabricated houses are built of standardized sections made in a factory and assembled on the building site Here workers fit an ceiling panels Prefabrication cuts building costs but families have little opportunity to modify designs

The Problem of Cost

BEHIND the physical tasks of building new homes and reconstructing older neighborhoods is the problem of cost. No one can estimate it accurately, but it certainly would amount to many billions of dollars a year. This problem was intensified by the increased construction costs in the years after the second World War.

Housing authorities often classify family incomes by "brackets." When the housing shortage reached a crisis during the late 1940's the Federal Reserve Board estimated the "money income" of American families was about as follows:

A. 15 per cent received more than $5,000 a year.

B. 55 per cent received $2,000 to $5,000 a year.

C. 30 per cent received less than $2,000 a year.

(In general, "money income" includes wages, salaries, and income from a business or profession; pensions and welfare payments; annuities; and income from investments. It does not include savings or insurance benefits spent for current family living or produce raised and consumed by farm families.)

During this period there was a serious shortage of rental housing at every level of income. At the same time the median price of new and existing houses ranged from $7,000 to $8,500 each. Most of the families in the lower-income groups could not pay $7,000 to $8,500 for a house. But if government agencies helped provide housing for many of these families, those who were not benefited would have to help pay the cost through some form of taxation.

The American people have traditionally accepted taxation as the means of providing certain public services. Among them are education, police and fire protection, sewage disposal, and provision of highways and roads. The use of government funds in the housing field would automatically add housing to these public services. This raises two basic questions: (1) to what extent should or could this service be undertaken, and (2) should the cost be paid by local, by state, or by federal tax levies?

The Costs of Home Ownership

The cost problem becomes particularly plain in the field of home ownership. Few families have enough savings to cover the full purchase price of a home. Usually they make a down payment and borrow the remainder on a mortgage with their property as security. Loans may be made by banks, building and loan associations, or investment brokers. The cost of the loan (financing charges and interest) must be added to the cost of the house and all other expenses through the years.

How all these expenses break down on a monthly basis is shown in the table on this page. The totals at the bottom are what families must be prepared to pay every month for 20 years in order to buy houses (new or old) at the prices shown.

Part of the home-buying problem was solved by the National Housing Act of 1934. The act created the Federal Housing Administration, which insures approved loans. This made it possible for a home buyer to obtain a single, long-term mortgage with a small down payment. The buyer could then repay the loan with moderate monthly payments that included taxes and insurance. One out of every three new homes is now financed with FHA-insured mortgages.

Supplementing the FHA was the home-loan feature of the "G.I. Bill of Rights." Under this provision about 2 million veterans bought homes with little or no down payment and with low carrying charges. These programs helped raise the proportion of American families who own their homes to about 55 per cent.

SOME OF THE COSTS OF BUYING A HOME

I PRELIMINARY COSTS. The owner-to-be usually pays certain preliminary costs, such as property survey, service charges, and fees. These may vary from less than $100 to $200 or more.			
II. TOTAL COST OF HOUSE.	$5,000	$7,500	$10,000
25 per cent down payment*.....	1,250	1,875	2,500
Amount of loan needed (20-year mortgage)	$3,750	$5,625	$7,500
III. MONTHLY COSTS			
1. Payment on loan over 20 years (principal and interest at 5 per cent)	$24.75	$37.13	$49.50
2. Taxes, Insurance, and Maintenance (based on 3½ per cent of original cost)	14.58	21.87	29.16
3. Heat and Utilities (moderately cold winters).....	10.83	12.92	15.00
Total monthly cost to home owner.....	$50.16	$71.92	$93.66

*With FHA insured mortgage, purchaser of a new home could make smaller down payments.

Before purchasing a house the buyer should estimate all the costs of home ownership. This helps make certain that the monthly costs will not exceed what he can afford to pay for a home.

Building by Private Enterprise

THE GREAT majority of American homes have been built by *private enterprise*. This means the dwellings were erected for individual owners, for sale at a profit, or for investment. As new homes were built, many of the older buildings became available at lower prices. This provided used dwellings for families who could not afford new construction.

Most authorities agree that private enterprise can provide the major share of the new housing needed. But to build enough good homes for the lower-income groups would require lower costs and greatly increased production. Part of this twofold problem was solved after the second World War when more houses were built than ever before in history. Much of this pro-

duction was in the form of large projects of single family homes put up by 'merchant builders' They acquired tracts of vacant land divided it into city blocks and lots and provided for water sewage and electrical connections They then built homes by the hundreds on the improved *subdivisions* These large-scale operations reduced costs and thus provided homes for many families who previously had been unable to afford good housing

Preventing Future Blight

For many years the quality of such housing was left largely to the discretion of the builders Some created well planned neighborhoods and established legally binding restrictions upon the use of the property Such neighborhoods often maintain stable property values much longer than the 50-year average Poorly planned subdivisions with no restrictions upon property use proved to be the most likely sources of neighborhood blight

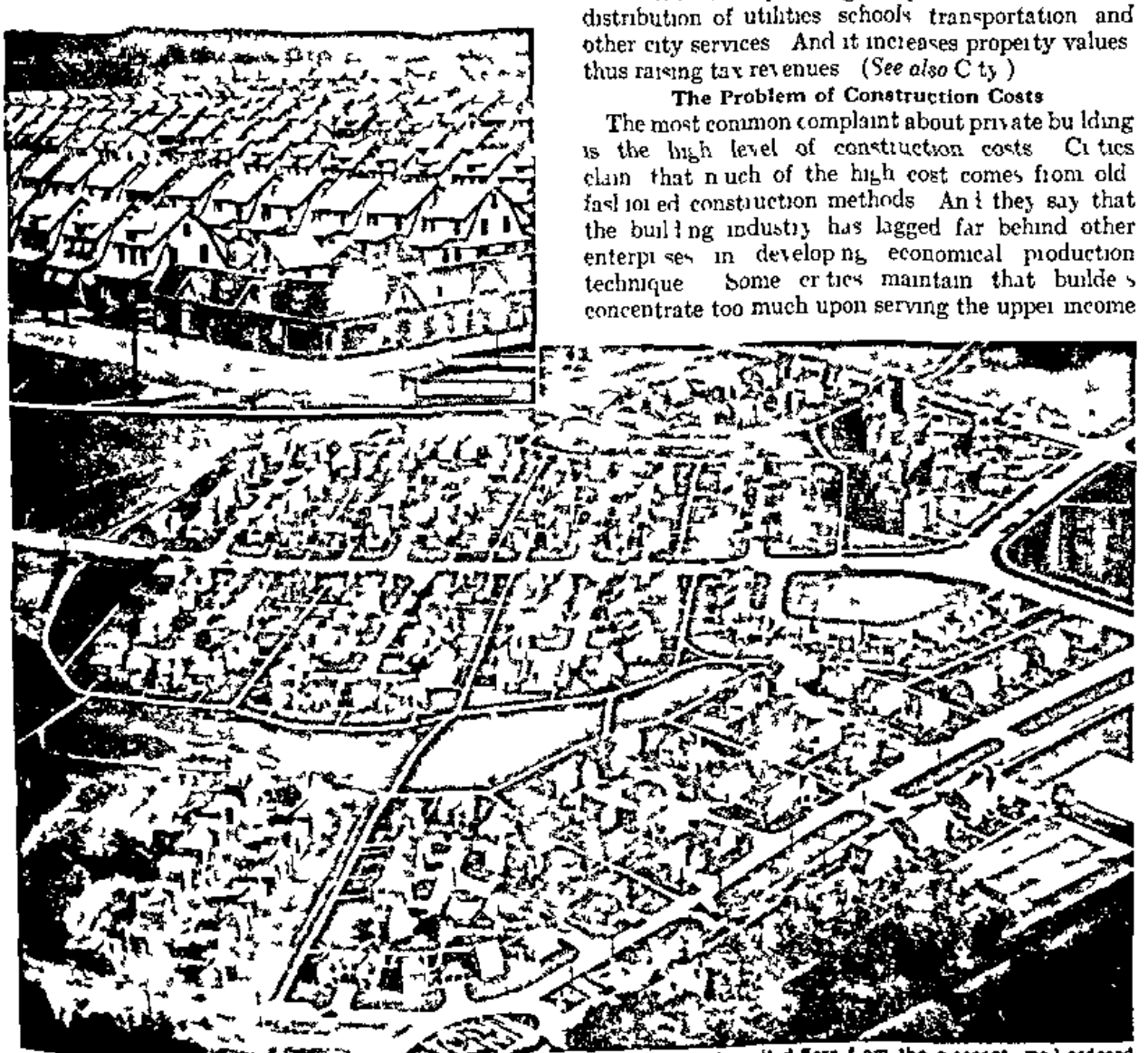
Today most cities try to insure lasting value in new developments and to preserve values in established neighborhoods through *zoning ordinances* New businesses (stores or factories) are restricted to certain areas in the community Multiple unit dwellings are also restricted to certain areas to protect neighborhoods of single family homes The ordinances may limit the amount of land used for buildings thus leaving ample space for playgrounds and lawns Within a residential zone a city can control new housing by enforcing *building codes* These laws specify the use of certain building materials to insure safe fire resistant construction

Many cities have long range plans for redeveloping blighted areas and guiding new growth Such planning can prevent overcrowding wasteful construction and other housing errors that lead to future blight and slums Good planning also permits an economical distribution of utilities schools transportation and other city services And it increases property values thus raising tax revenues (*See also* City)

The Problem of Construction Costs

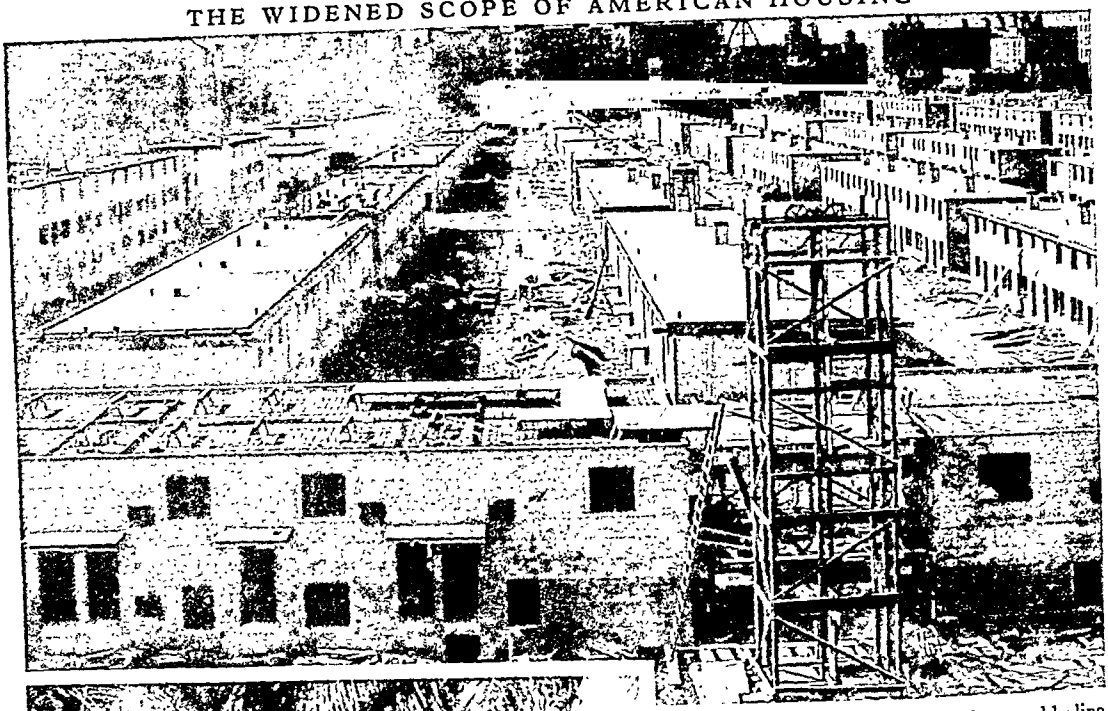
The most common complaint about private building is the high level of construction costs Cities claim that much of the high cost comes from old fashioned construction methods And they say that the building industry has lagged far behind other enterprises in developing economical production techniques Some cities maintain that builders concentrate too much upon serving the upper income

WHICH COMMUNITY WAS WELL PLANNED?



The unattractive neighborhood at top grew without proper planning Notice how it differs from the pleasant well-ordered community of Sunnyside Queens New York City at bottom Proper planning provides ample living space for all

THE WIDENED SCOPE OF AMERICAN HOUSING



Redeveloping a city slum area (top) requires vast sums of money. Builders must buy up land and demolish the old buildings before they can construct new housing. The cost of building on vacant land is usually less. At the bottom, children play under the palms in a Florida trailer park. After World War II more and more Americans began to explore the possibilities of life on wheels.

levels. For example, a survey showed that in one year 76 per cent of all new housing was built for the 12 million American families with the highest incomes. In the same period less than 2 per cent of the new housing was built for the 12 million families with the lowest incomes.

Spokesmen for the construction industry have replied to these criticisms. The National Association of Home Builders denied lack of progress in the industry. It pointed to new mass-production methods in manufacture, increased use of power tools and other laborsaving devices, and assembly-line methods of construction on large-scale operations. The National Association of Real Estate Boards stated that sales to families on higher income levels usually leave vacancies in older housing and thereby increase the supply of used homes for those families who earn less.

Many attempts have been made to provide lower-cost housing by prefabrication (*see* Building Construction). Mass-production methods result in savings of about 20 per cent through large-scale purchasing of materials and reduced construction costs. Thousands of prefabricated houses were built after World War II. This production was helped in part by government loans. The results, however, did not begin to meet the housing need of the middle- and low-income groups. Prefabrication was handicapped by four difficulties: (1) transporting the factory-built house to the buyer; (2) inability to comply with many building codes; (3) obtaining the work of union labor to erect such housing in many areas; and (4) reluctance on the part of buyers to accept this new type of housing.

Greater progress was made by co-operative building and mutual home ownership. Large-scale construction and operation achieve economies which are passed along to the buyers. Buyers may buy units outright; or, under the mutual-ownership plan, they buy shares in the corporation which entitles them to occupy a dwelling unit.

How Demand for Government Aid Arises

WHATEVER the future course of construction costs may be many families will never be able to buy or rent new housing at full value This situation raises the problem of how to meet their needs One method is to provide adequate housing in the older neighborhoods

Repairs can be profitably made as long as property values remain stable But if neighborhood decay sets in, private owners and builders can do little or nothing to arrest it They cannot profitably erect new homes They cannot condemn property in order to remove undesirable structures They cannot levy special assessments to meet the cost of improvements in the neighborhood Action by some government authorities having the necessary power is required

Problems Involved in Slum Clearance

In slum areas government action becomes imperative All housing in the area must be torn down Stores, factories, and other undesirable features must be removed Through traffic should be rerouted to create quiet safe residential surroundings Then new housing must be constructed

All this requires expenditures of huge sums of money, but most of the people in the area cannot pay rents that would repay the costs of reconstruction For example after a detailed study Federal government agencies estimated the cost of building and maintaining a public housing unit at $54 49 a month But the highest possible rent that could be expected was about $30 a month The difference of $24 49 had to be made up in other ways

A final problem in slum clearance is providing shelter for those dispossessed by huge slum clearance projects Mere dispossession would only force many families into already crowded areas Thus slum clearance should be accompanied by building on vacant or nonresidential land

Government Aid to Private Enterprise

CITIES states and the Federal government have all helped provide housing But government bodies do not have enough money to replace all the slums and substandard housing in the United States Therefore efforts have been made to enlist private enterprise to do part of the work

Under this plan a local government agency obtains title to blighted areas It may do this by purchase, or, under the right of eminent domain it may condemn the land and pay prices set by a court The local agency then sells or leases the site to a private company, which constructs and manages the new housing The local agency may also provide some form of indirect *subsidy* or assistance This enables the private company to charge a lower rent and still make a profit

Subsidies to Reduce Costs

One form of subsidy is to exempt the buildings from taxation for a period of years In return, dividends (profits) are limited to about 6 per cent Under this 'limited-dividend' plan, Knickerbocker Village was built in New York City in 1934 It houses 1 600 families of moderate income

Cities provide another form of subsidy by acquiring a slum site at market value and then selling the property as vacant land (This lower price is called the 'write-down') Government funds pay for clearing the area as well as the difference between the purchase price and the write-down price This subsidy enabled one company to build a large-scale housing project in Chicago The new construction replaced a hundred acres of blighted homes

With the aid of such subsidies insurance companies and other institutions have made long-term investments in housing projects in several cities One such project was Parkchester built by the Metropolitan Life Insurance Company in New York City in 1941 It houses 35 000 people of the middle income group

Because of the high cost involved private enterprise and local governments made only limited progress in slum clearance But under the Housing Act of 1949 the Federal government entered the field on a vast scale The act authorized one billion dollars in loans for slum clearance It also provided cash grants to pay two-thirds of the loss incurred in preparing blighted areas for private development

Public Action to Provide Housing

MOST authorities believe that private enterprise, with some government aid can provide standard housing for all but the lowest-income families One method of providing adequate low-rent homes is *public housing* This is usually administered by a local government agency called the *housing authority*

The housing authority initiates public housing It acquires the site and contracts with private companies to clear the land (if necessary) and build the project The authority then manages the housing It scales rents to what low income families can afford rather than at a level which would repay all costs The resulting deficit is paid by the local government with help from the state and Federal governments for approved projects

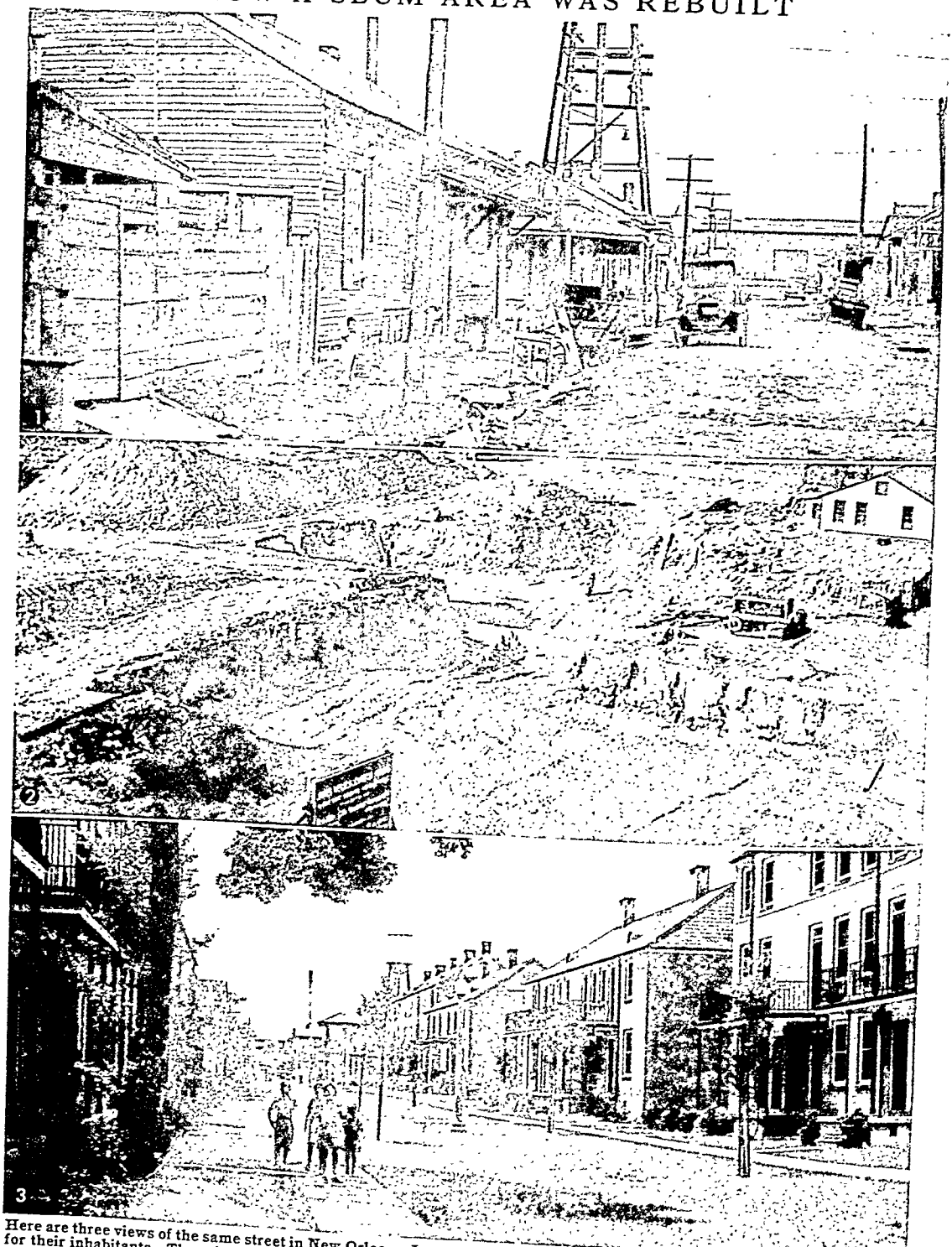
Under the Housing Act of 1937, 191 700 low rent public housing units were built in 268 communities The Housing Act of 1949 provided funds to help pay for the construction and operation of 810 000 additional units in six years Many of these projects were to be built on vacant land to house low income families dispossessed by slum clearance programs

Arguments about Public Housing

Widespread and bitter objections have been made to public housing on many grounds Some critics have urged that it is unfair to provide new housing at lower rentals than those paid for older, less desirable accommodation, and then meet the cost by raising the taxes of those who are already paying fully for their own housing Another objection has been that public housing is a blow at private enterprise in the construction and property management fields

Public housing advocates claim that private enterprise is not affected since it never did clear slums,

HOW A SLUM AREA WAS REBUILT



Here are three views of the same street in New Orleans, La. 1. The cramped, worn-out slum dwellings provided poor housing for their inhabitants. There is little incentive for persons to fix up their homes in such a neighborhood. 2. Aided by funds from the Public Housing Administration the city bought the land and demolished all the old buildings. 3. The entire area was then redeveloped according to plan. The homes now provide adequate, low-rent housing in a pleasant attractive neighborhood.

and could not make a profit at rentals which low-income families could afford They maintain that the tax burden would be more than offset by relieving the high cost of public services in slum areas by reducing delinquency and crime and by generally improving the standard of living in the city

Public housing has also been criticized because it pays no taxes But such projects do pay a service fee to the city This payment may be up to 10 per cent of the rent charged Public housing advocates claim that this fee usually matches or exceeds the tax revenue obtained from the old slum site

Public Housing in Europe

Most of the nations of the world have also had a housing problem In Europe the shortage was made worse by the destruction resulting from two world wars Between wars, however several nations built public-housing projects to provide low rent homes Various governments also made long term loans and gifts of land to cities and building societies for housing projects

Much of the new housing in Sweden and elsewhere was built by cooperatives After the second World War, housing construction depended largely upon how fast the nations rebuilt their commerce and industry

Housing Legislation in the United States

GOVERNMENT aid to housing began in 1867 when New York state passed the first tenement house law in the country It authorized 'the use of police power to regulate the use of private property as tenements in the interests of health, safety, and morals" A more far reaching New York law, passed in 1901, forbade building tenements with inside rooms But the "old law" homes remained in use

In 1918 the Federal government built dwellings for workers in war industries After the war a California bond issue provided the means for low income war veterans to buy homes and farms and to pay for them in 20 years Beginning in 1926 New York State aided housing by granting partial tax exemption to approved limited-dividend projects

Large-scale government aid to housing began in the 1930 s when economic depression brought widespread distress Federal loans and loan insurance helped check the loss of many homes The Housing Division of the Public Works Administration built 51 projects housing 21 800 low income families in more than 30 cities This action also provided employment for workers in the building trades

The National Housing Act of 1934 has been amended many times to stimulate home ownership and housing construction through low interest, long term mortgages Its chief agencies were the Federal Housing Administration which guarantees repayment of approved loans, and the Federal Savings and Loan Insurance Corporation which insures savings deposits up to $10 000 in approved institutions

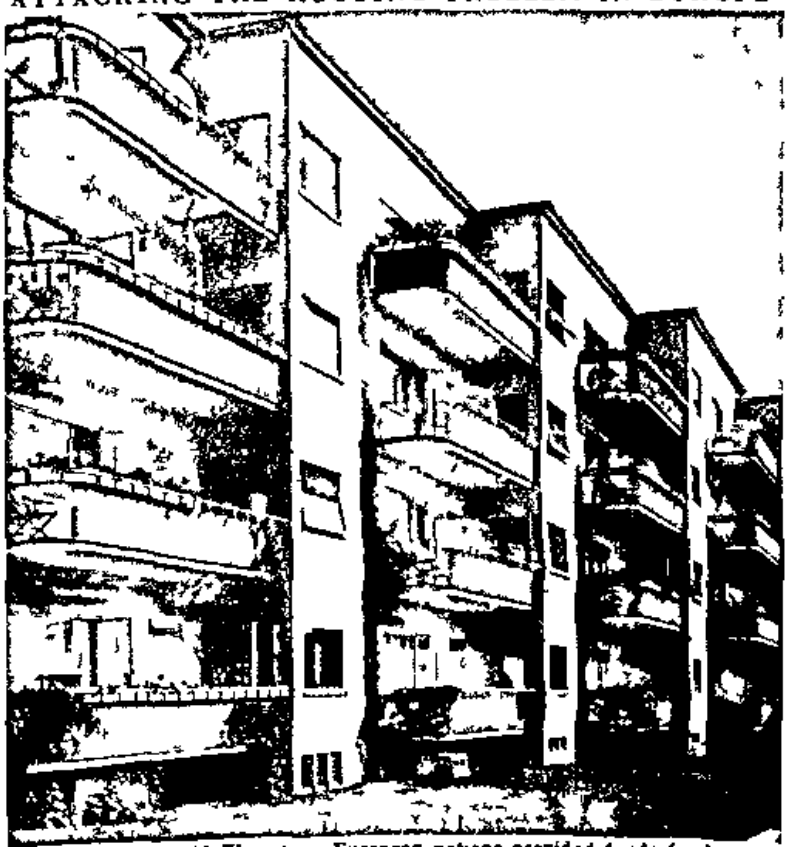
Housing after the Second World War

During the second World War the government built temporary housing for thousands of workers in vital industries After the war emphasis shifted to relieving the housing shortage The Federal government helped veterans meet the cost of new housing by providing loan insurance and buying mortgages for resale to investors

In 1947 a new law consolidated most federal housing activities under the *Housing and Home Finance Agency (see* United States Government) Federal aid for slum clearance and public housing, which began in 1937 was greatly broadened by the Housing Act of 1949 This act also authorized 300 million dollars in loans and grants to aid farm housing

In 1953 the Census Bureau reported that housing conditions were improving However, there was need for even more improvement The extension of federal rent controls into 1953 indicated severe housing shortages in some urban areas Moreover, construction would have to remain at peak levels to provide new housing for a rapidly growing population (For Reference-Outline and Bibliography *see* Shelter)

ATTACKING THE HOUSING PROBLEM IN EUROPE



After the first World War many European nations provided funds for building low cost homes for workers This apartment building was constructed by the government of Sweden and sold to Swedish citizens on the installment plan.

A HERO OF TENNESSEE AND TEXAS



This picture shows Sam Houston when he was 64 years old, after he had served as governor of two states

HOUSTON (*hūs'tŭn*), SAMUEL (1793–1863). People called Sam Houston "SIX FEET SIX" because he looked big and did big things. In the War of 1812 he rose from private to lieutenant. At the battle of San Jacinto he commanded the troops that won independence for Texas. He served Tennessee as congressman and governor, and Texas as senator and governor. He was twice president of the republic of Texas.

Sam was the son of Maj. Sam Houston, who stayed in the army after the Revolutionary War. Sam was born in Rockbridge County, Va., March 2, 1793. After Major Houston died, Sam's mother moved with her children to a farm in Tennessee.

The boy did not like school but he read a great deal. When he was 16 his older brothers got him a job in a village store. Disliking storekeeping, he ran away to live with the neighboring Cherokee Indians. Their chief, Oolooteka, adopted Sam as his own son. He lived with the Cherokees for nearly three years and visited his family only occasionally.

Sam returned home and opened a log-cabin school. But he soon volunteered for duty in the War of 1812. He served under Andrew Jackson against the Creek Indians. He was a capable soldier and rose through the ranks to a commission as lieutenant. In 1814 he was wounded at Horseshoe Bend, Ala.

By this time Sam had reached his full height of six feet two inches. He had long brown hair and keen gray eyes. Jackson liked his young officer and after the war helped him become a subagent for the Cherokee Indians. Houston retained his commission until 1818. He resigned from the army because the secretary of war, John Calhoun, reprimanded him when Sam came to Calhoun's office in Indian dress.

Houston returned to Tennessee and studied law for six months. In his first year of practise he was elected district attorney. Houston enjoyed politics He was an expert stump speaker and dressed colorfully in either white men's or Indian clothes. Again aided by Jackson, he was appointed major general of the Tennessee militia in 1821. Two years later he was elected to Congress, and in 1825 he was re-elected. He was only 34 years old when he was elected governor

In 1829 Houston married. The marriage was a failure, and the couple separated. Deeply grieved, Houston resigned his office and quit his campaign for reelection. When the Cherokees were moved to a new home in Arkansas, he followed. For six years he traded with them and acted as their adviser. Several times he traveled to Washington, D.C., to fight for their rights. During this time he visited Texas. He became interested in the demand for separation from Mexico.

Texas declared its independence in March 1836 and established a government (*see* Texas). Houston was chosen commander in chief of the army raised to battle General Santa Anna, the Mexican dictator who had marched north to put down the revolt. Houston retreated before Santa Anna's advance until he lured the Mexicans into a trap. Then on April 21, 1836, Houston attacked Santa Anna at San Jacinto. In 15 minutes the battle was over and Santa Anna was taken prisoner. Texas independence was assured.

Houston was elected president of the new republic. He administered his office wisely but under the laws he could not succeed himself. He served a term in the Texas congress, and in 1841 became president again. Meanwhile in 1840 he had married Margaret Lea of Alabama. They had eight children.

Houston worked hard to have Texas annexed by the United States. He succeeded in 1845; and the annexation brought on the Mexican War. Houston refused a general's commission but served as senator from the new state. He was defeated for governor in 1857 but was elected in 1859.

The Civil War was a difficult period for Houston. Most Texans were for the South, but Houston believed that the Union must be saved. In 1861 he was deposed as governor. He refused the offer made by Union soldiers to return him to office. He died July 26, 1863, in the middle of the Civil War.

HOUSTON, TEX. Standing in the center of the rich Gulf coast oil fields, Houston is the biggest city in the Southwest. Its port, one of the busiest in the nation, ships petroleum products all over the world. Its skyscrapers hold the offices of the nation's important petroleum companies. But oil production is only one of Houston's many activities. It is a booming industrial and financial center as well.

Houston is on Buffalo Bayou (a river), 50 miles inland from the Gulf of Mexico. Houston Ship Channel (opened 1914) follows Buffalo Bayou to the San Jacinto River and crosses Galveston Bay to the Gulf of Mexico. The channel is dredged 34 feet deep and has a width varying from 200 to 400 feet. In the city is a large basin where ships can be turned about

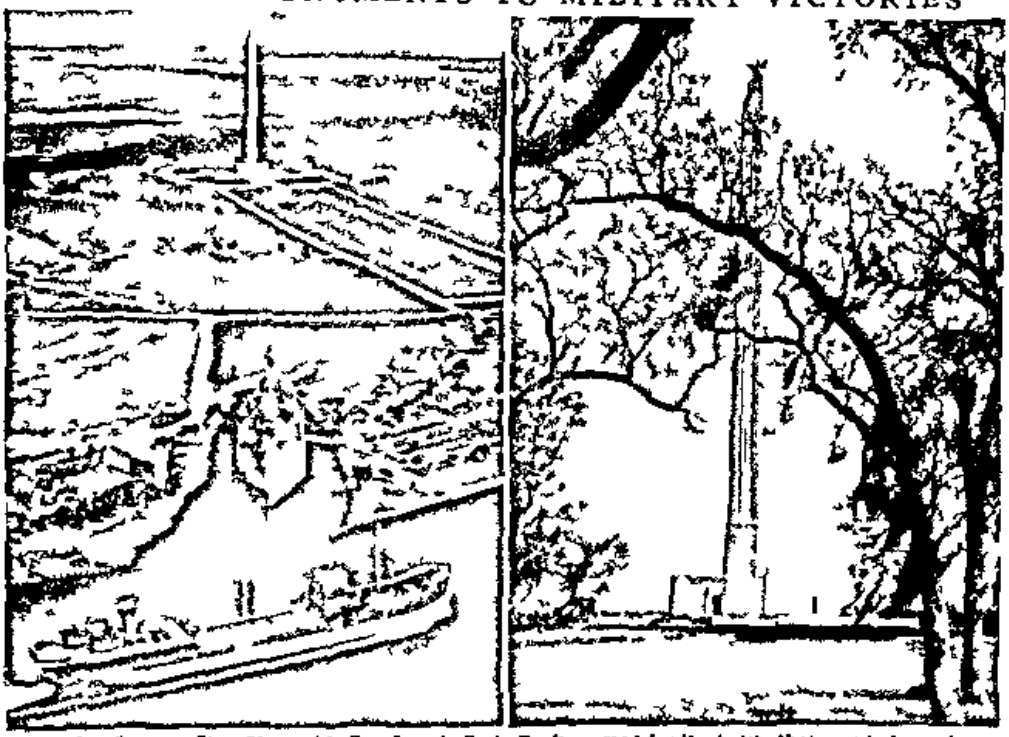
Houston is served by six rail systems bus and truck lines and domestic and international airlines

The climate is warm and most summer temperatures often reach 100° F The annual rainfall is about 46 inches Pine yaupon cotton wood sycamore oak swamp hickory and graceful magnolia trees grow in and about the city Most Houston homes have gardens of azaleas roses camellias and other flowers in bloom much of the year

Many of the industries are built along the Houston Ship Channel They include oil refineries chemical companies synthetic rubber plants paper and flour mills cement factories a steel plant and shipyards

In the city are Rice Institute the University of Houston Baylor Medical College the University of Texas School of Dentistry and the Texas Southern University After the second World War the building of a 100-million dollar medical center was begun Houston has a notable library art museum and symphony orchestra Only a few miles east of the city lies San Jacinto State Park

HOUSTON MONUMENTS TO MILITARY VICTORIES



Along the Houston Ship Channel is San Jacinto State Park named for the battle that won independence for Texas At left a tanker passes the battleship *Texas* a veteran of two World Wars It is permanently moored here Beyond is the San Jacinto Monument At the right is a close view of the 570 foot shaft

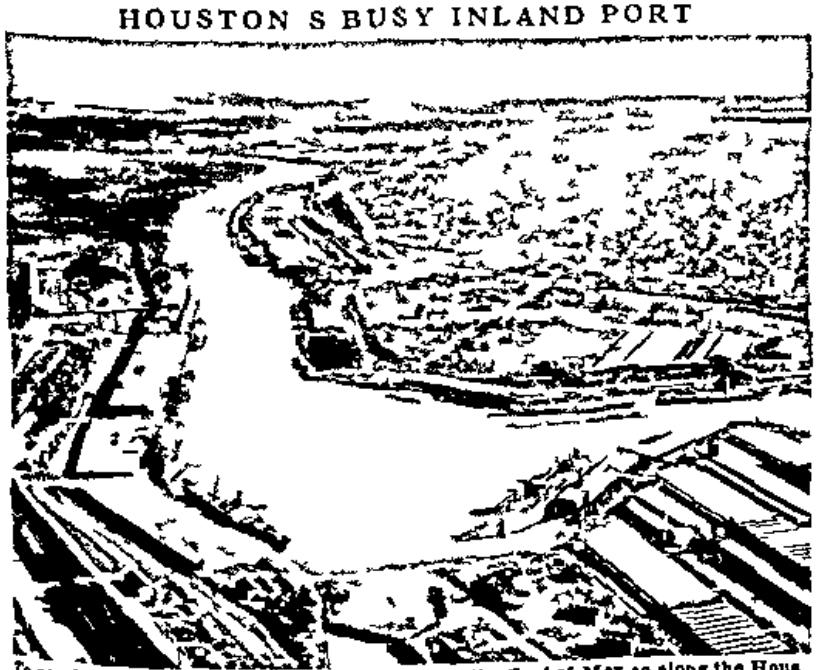
Houston's Colorful History

Before 1836 the site of Houston was an uninhabited mosquito-infested marsh In that year two brothers John K and Augustus C Allen bought the site for one dollar an acre They laid out streets and named the town for the Texas military hero Gen Sam Houston The city became the first capital of the republic of Texas It served as capital in 1837 39 and again briefly in 1842 during the Archive War (*see* Texas)

The city became a port for shallow draft boats Lumber rice and beef were processed and shipped By 1890 Houston had four railroads cotton seed-oil plants carriage and wagon factories breweries and busy sawmills The city boomed with the gush of the Gulf coast oil fields (*see* Petroleum) During the first World War it became an important military center In the second World War Houston's industry expanded with a $30 000 000 government chemical manufacturing program

After the war new buildings and new highways were built and the Houston Ship Channel was improved In 1947 a mayor-council replaced the city manager form of government In 1949 Houston's corporate area

HOUSTON'S BUSY INLAND PORT

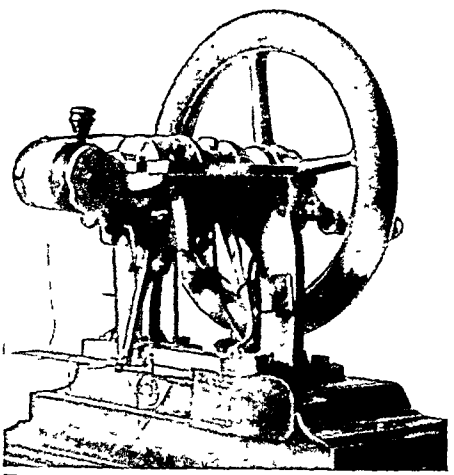


To reach Houston ocean going ships travel from the Gulf of Mexico along the Houston Ship Channel They handle various cargoes at the wharves and turn around in the wide turning basin before heading back to world wide ports

was enlarged to include about 155 square miles. This annexation doubled the original size of the city and increased Houston's population by an estimated 100,000. Population (1950 census), 596,163.

HOWE, ELIAS (1819–1867). Before Elias Howe invented the sewing machine, the fastest needlewoman could sew by hand only 50 stitches a minute. Howe's invention stitched five times that fast. At first Howe found it difficult to sell his machine. Eventually his sewing machine established mass production of clothes and other sewn goods.

THE FIRST SEWING MACHINE



Howe made this working model of his first sewing machine for submission to the Patent Office. It secured his rights to the new invention.

Elias was born in Spencer, Mass., on July 9, 1819. His father worked a small farm and a grist mill and did odd jobs. Elias, though small and lame, helped his father. In Lowell, when he was 16, he got a job in a factory making cotton-weaving machinery. Two years later the panic of 1837 threw him out of work. Elias' search for a job took him to Boston. There he found work as a machinist. He married in 1841. About this time he overheard an inventor speak of the need for a machine that would sew.

The problem interested Howe. First he tried a needle pointed at both ends and with an eye in the middle. It was not successful. Then he thought of a machine that made a lock stitch (*see* Sewing Machine). Howe left his job to work on his invention. He tried to support his family of three children by doing odd jobs. But he could not make enough money. He moved his family into his father's home. A little later he interested a friend, George Fisher, in his machine. Fisher invited the Howe family into his home and gave Howe money to go on with the invention. In April 1845 Howe completed his first successful sewing machine and looked for buyers.

But tailors and other garment people were afraid that the sewing machine would throw them out of work. Howe patented his invention and struggled on. He sold the English rights for $1,217 and went to London to adapt the machine to the buyer's special needs. Howe's wife died soon after he returned to the United States.

While Howe was gone, American manufacturers stole the invention. Howe sued them. His rights were recognized by the courts in 1854. Not long after, sewing-machine sales brought him $200,000 a year, and he began to enjoy his wealth.

Howe remarried. When the Civil War broke out he helped to outfit a Connecticut regiment. He himself enlisted as a private. But a soldier's life was hard on the frail middle-aged man. In 1867 he died in Brooklyn, N. Y.

HOWELLS, WILLIAM DEAN (1837–1920). During his last years William Dean Howells was recognized as the dean of American literature. He wrote more than 75 novels and numerous farces and comedies, essays and criticisms, and poems. As a writer, a magazine editor, and a critic he helped develop the school of realism in American fiction.

The son of a migratory printer-editor, Howells was born at Martin's Ferry, Ohio, on March 1, 1837. When he was nine he began to set type in his father's shop. He did not attend high school or college. But he studied foreign languages in a windowed nook below the stairs of his home and learned much of the literature in those languages. Between 1856 and 1861 he worked on the *Ohio State Journal* at Columbus as reporter and editor. In 1860 he published a book of poems and a life of Lincoln that sold widely because of the presidential campaign. On the proceeds he went to New England, where he met the writers Lowell, Emerson, Holmes, and Hawthorne. In 1861 Lincoln appointed him consul at Venice. In 1862 he married his Columbus sweetheart, Elinor G. Mead, in Paris. They had three children.

Howells returned to America in 1865. After a few months in New York, he was appointed subeditor of the *Atlantic Monthly* in Boston. In 1871 he became editor in chief. Howell's first novel, 'Their Wedding Journey' (1871), was written in Boston. Howells left the *Atlantic Monthly* in 1881 and devoted himself to writing. In 1891 he moved to New York and for a few months was editor of *Cosmopolitan Magazine*. Later he went to *Harper's Monthly*. Here, from 1900 to his death, he conducted 'The Editor's Easy Chair', a review of contemporary life and letters. He was the first president of the American Academy of Arts and Letters and served until he died.

Howells was tolerant and democratic. He believed that art should serve morality and that it is a writer's duty to present life realistically rather than in amusing or heroic patterns. He strongly believed that everyday American life provided the most worthy material for American literature. His own writing fulfilled these beliefs. Howells' books possess a quiet charm that continues to hold a small but enthusiastic audience. (*See also* American Literature.)

Among Howells' best-known novels are: 'Their Wedding Journey' (1871); 'A Foregone Conclusion' (1875); 'The Lady of Aroostook' (1879); 'A Modern Instance' (1882); 'The Rise of Silas Lapham' (1885); 'Indian Summer' (1886); 'A Hazard of New Fortunes' (1889); 'The Kentons' (1902).

HUDSON, HENRY (1575? 1611) By Henry Hudson's time European nations were doing a thriving business in spices and silks with the Orient But the old eastern sea route was long, slow and costly and men dreamed of finding new waterways to the Far East They reasoned that if they could sail northeast or northwest through polar waters they could descend along the Siberian coast and reach China and the Indies Henry Hudson tried to find both a northeast and a northwest passage He failed but his four voyages added greatly to man's knowledge of the Arctic and North America

Little is known of Hudson before 1607 His family may have been interested in the Muscovy Company an English trading firm Hudson's first two voyages were for this company On the first voyage in 1607 he sailed to the east coast of Greenland then east to Spitsbergen But he could not find a passage through the polar ice barrier Hudson's son John went with him on this and the later voyages

On Hudson's second voyage in 1608 he tried the Arctic Ocean north of Europe and Asia He reached Novaya Zemlya but was turned back by ice in Kara Strait the pass between Europe and Novaya Zemlya

The next year Hudson commanded the *Half Moon* for the Dutch East India Company Again he tried the northeast passage Off the coast of Novaya Zemlya the crew rebelled against cold and hardship So Hudson sailed south and westward to America He explored the inlets southward along the coast to southern Virginia probing for a passage across the continent He then turned north to the river that now bears his name the Hudson and sailed up it to the present site of Albany

A group of Englishmen backed Hudson's fourth voyage (1610–11) They gave him the *Discovery* and a crew of 25 men By mid-July the ship reached Hudson Strait the entrance to Hudson Bay Hudson put down a mutiny He sailed into Hudson Bay and explored the east coast to its southernmost reach in James Bay There the ship was icebound during the long winter of 1610–11

In June the *Discovery* broke loose from the ice and sailed north Again it was caught by ice floes Most of the crew mutinied Hudson his son and seven sick men were forced into a small boat and set adrift to perish Several mutineers were killed by Eskimos The survivors brought the *Discovery* back to England and were tried for mutiny

CAST ADRIFT IN ICY WATERS



When Hudson's crew mutinied they gave their captain a slight chance for life With his son John and seven sick men he was cast adrift in a small boat No trace of the group was ever found

HUDSON BAY The third largest landlocked sea of the world is Hudson Bay It lies in northeastern Canada and extends 800 miles from north to south and 990 miles from east to west The total water area is 475,800 square miles The average depth is 420 feet but James Bay the farthest south extension of Hudson Bay is quite shallow

Among the many rivers that flow into the bay are the Nelson and the Churchill Hudson Bay connects at the north with the Arctic Ocean through Fury and Hecla Straits and Foxe Channel Hudson Strait the passage east to the Atlantic Ocean, is a deep gorge of varying width grooved out of solid rock The east and northeast shores have high bluffs Low swamps border James Bay Forests of spruce balsam, and poplar border the southern shores but the limit of trees is reached a few miles south of Churchill Caribou musk ox many kinds of fur bearing animals and birds are plentiful and the bay has salmon porpoise whale and other fish

Eskimos and Indians live by hunting fishing and trapping In the summer a Hudson's Bay Company ship carries supplies to the trading posts along the shores and picks up furs The bay does not freeze but it is filled with drifting ice for nine months

The largest town is Churchill Manitoba on the west shore The Hudson Bay Railroad connects it with The Pas 510 miles to the southwest Churchill has a fine modern harbor at the mouth of the Churchill River and a grain elevator with a capacity of 2½ million bushels During the summer wheat is shipped from Saskatchewan to Churchill for export to the United Kingdom Manufactured products are shipped in for distribution in central Canada A large military airport is maintained jointly by Canada and the United States Fort Prince of Wales across the river, is a national historic park (*see* National Parks)

Hudson Strait was entered by the Cabots in 1498 (*see* Cabot) Hudson Bay was first explored by Henry Hudson in 1610 (*see* Hudson)

HUDSON RIVER. Fascinating legends, interesting stories of history, and picturesque scenery combine to make the Hudson River one of the most renowned rivers in the United States. The excellent harbor which its mouth affords has helped New York City to become the greatest city of the New World.

Rising in the heart of the Adirondacks in the northeastern part of the state, the Hudson is at first narrow, winding, and rock-obstructed, and then flows past wooded hills and cultivated slopes until it reaches tidewater at Troy. Here it is joined from the west by its chief tributary, the Mohawk. From Albany down it is like a long arm of the sea, broad and stately. The Catskill Mountains rise in varied beauty on the west side of the river. Lower down, the Hudson enters the Highlands, the scene of Arnold's treason and Andre's death, a region of rock-ribbed hills and mountains. The United States Military Academy at West Point and the ruins of Fort Putnam are situated a few miles below. Emerging from the Highlands near Stony Point, where "Mad Anthony" Wayne stormed and captured the British stronghold, the river expands to form the Tappan Zee (or Bay). Thence the Palisades, a wall of rock 300 to 500 feet high, majestic and awe-inspiring, extend 20 miles along the New Jersey shore. Just south, near Weehawken, the Burr-Hamilton duel was fought. The banks of the much traveled waterway, once covered by forests, are dotted with towns, hamlets, and country estates, until New York City's many docks and wharves are reached. Then the river empties into New York Bay, 306 miles from its mountain source.

An Aid to Early Development

The Hudson River was first explored in 1609 by Henry Hudson, from whom it gets its name. In early days the name North River was often applied to it, to distinguish it from the Delaware, or South, River, and this name is still given by New Yorkers to its lower part. Since the Hudson furnishes the only deep waterway through the Atlantic highlands open to large vessels, it greatly aided the early commercial and industrial development of New York. Before railroads were built it carried nearly all the traffic from the fertile country of the west and north. The first successful attempt at steam navigation was made by Robert Fulton on this stream, and with the opening of the Erie Canal from Troy to Buffalo in 1825 a continuous waterway connected New York City and the North Central States. Ocean-going vessels still travel up as far as Troy, where they are loaded with freight which has come by water from Duluth or other western points through the Great Lakes and down the Erie Canal. The falls and rapids furnish electric power which is used as far away as the coal fields of Pennsylvania.

HUDSON'S BAY COMPANY. Scattered over the vast northern regions of Canada, up to the shores of the Arctic Ocean, lie the fur-trading stations of the great Hudson's Bay Company. For nearly 300 years these have been the outposts of civilization in a remote and lonely land. More than 200 such posts are located along the shores of Hudson Bay, James Bay, and the Arctic Ocean and throughout interior western Canada.

Each post consists of a bungalow in which the manager and his family live, a warehouse, and a store. Two-way radio and the airplane which brings in supplies from the company's merchandise depots in the south help relieve the lonesomeness of the posts. Indians, Eskimos and half-breeds bring to the posts their stock of furs accumulated by the winter's trapping. They trade the pelts for food, weapons, and clothing in the company store. The pelts are then sent by airplane, ship, or light-draft river steamboat to "gathering centers" in the larger cities of southern Canada. From the gathering centers they go to the fur-marketing centers of Montreal, New York City, and London.

About the time of the first World War the company began expanding its wholesaling and its retail store activities. It now has the third largest chain of retail stores in Canada. The company operates its own airplanes and its own fleet of ocean ships and river boats.

Boundless Wealth in Furs

The early history of this company and its rivals is closely tied to the history of northwestern Canada. The Hudson's Bay Company began in 1670. Two French adventurers, Radisson and Groseilliers, had lost a fortune in furs to greedy government officials in Quebec. Enraged at the refusal of the French court to listen to their appeals, they took their tales of vast wealth to the English government.

King Charles II and his cousin Prince Rupert were fascinated. The king granted a charter to the prince and 17 associates, creating the "Governor and Company of Adventurers of England, trading into Hudson's Bay." This gave them sole rights of trade in the lands drained by rivers and streams flowing into Hudson Bay. They did not realize the vast extent of "Rupert's Land," as the territory was called. It covered Ontario; Quebec, north of the Laurentian Mountains and west of Labrador; all Manitoba; all Saskatchewan; and the southern half of Alberta. In 1821, when the company absorbed the rival North-West Fur Company, its vast holdings reached into what is now the northwestern United States and up to the Arctic Ocean. (*See also* Furs and Fur Trade.)

The Hudson's Bay Company had far more than trading privileges, for it also owned the land and governed the people. This arrangement was found intolerable when settlers moved into the region. In 1869 the company was forced to sell most of Rupert's Land to the new Dominion of Canada (*see* Canadian History). Subsequent sales have reduced its holdings to about 370,000 acres. Prospecting for oil is one of its newest activities.

HUGHES, CHARLES EVANS (1862–1948). Chief justice of the United States, member of the World Court, secretary of state, and governor of New York State, Charles Evans Hughes was a national figure for many years. He was born in Glens Falls, N.Y.,

the son of a clergyman of Welsh descent He received his A B from Brown University in 1881 then taught school while studying law, and going to New York City was graduated in law from Columbia University in 1884 being admitted the same year to the bar

He first attracted wide attention in 1905–06 by the searching way in which he conducted the investigation for a committee of the New York legislature of the great insurance companies in several of which scandals had become notorious Before this Hughes had become a marked figure in New York state by a similar investigation of New York gas rates then just concluded He accepted the new commission on condition that he should be absolutely unhampered His freedom from bias and his extraordinary capacity for analysis of monumental masses of detail as well as for hard work—sometimes 20 hours a day—appeared in the results Most of the recommendations made in the report he drafted were later enacted into law



CHARLES EVANS HUGHES
Statesman and Reformer

Elected governor of New York state on the Republican ticket for two successive terms (1907–08 1909 10) Hughes showed the same vigorous courage in forcing a reluctant legislature to pass various reform measures which included an anti race-track gambling law, a direct primary law and particularly a law creating a public service commission the outstanding achievement of his administration He abolished back stairs influences refusing private interviews to influential politicians and cleaned house by eliminating honest but incompetent officeholders as ruthlessly as the corrupt ones without regard to party services in either case A firm believer in the party system he was too honest too uncompromising, and too deficient in the arts of popularity to become a party leader

Governor Hughes resigned his office in 1910 to accept an appointment from President Taft to the United States Supreme Court—a position admirably suited both to his tastes and to his abilities He ranked as one of the ablest men on the bench and so long as he sat there he remained absolutely dissevered from politics

It was undoubtedly much against his own inclination that he resigned his position on the Supreme Court bench to accept the Republican nomination for the presidency against President Wilson in 1916 The party platform was vague with reference to the war and the campaign centered on bitter attacks on Democratic policies Whether for this or for other reasons many of Mr Hughes admirers felt that his campaign did not add to his reputation He was defeated in November (*see* Wilson Woodrow) and returned to the practice of law In 1918 President Wilson appointed him to conduct the investigation of charges of extravagance and corruption in the building of airplanes for the army and navy

From 1921 to 1925 Hughes served as secretary of state and handled many momentous issues including the peace treaty with Germany and the Washington disarmament conference In 1926 President Coolidge appointed him to the Hague Court of International Arbitration, and in 1928 he was elected a judge of the World Court Two years later he was appointed chief justice of the United States In 1941 he retired at the age of 79

HUGHES, SIR SAM (1853–1921) As Canada s minister of militia and defense at the start of the first World War in 1914 Lieutenant-General Hughes raised and equipped for overseas service a very large part of the 600 000 men that Canada contributed in that gigantic conflict and they were said to be among the best of all the British forces A man of force and energy he showed an ability in organization that amounted to genius He recognized no obstacles either for himself or others If anyone complained that the task he set was impossible his reply was Nothing is impossible Do it

Born on a farm in Ontario of Protestant Irish stock young Hughes enlisted in the militia in his 13th year and at the age of 17 won a medal for service against the invading Fenians who were seeking the overthrow of the British government in Canada He was educated at the Toronto Normal School and Toronto University and taught school for a number of years Then he took up newspaper work purchasing the Lindsay *Warder*, which he edited himself until 1897 In 1892 he was first elected to the Canadian House of Commons and from that time he played a prominent part in public affairs One of the principles he strongly advocated was that the Colonies should assist the Empire in time of war During the South African War he offered his assistance in raising troops besides serving in the intelligence and transportation departments He was several times mentioned in dispatches

Ever since his youth he had made a special study of military affairs and had risen in rank from private to lieutenant-general of militia His political and military knowledge and experience fitted him for the office of minister of militia to which he was appointed in 1911 In spite however, of the splendid results he obtained as an organizer and the esteem which he gained at first his administration of the militia office was bitterly criticized He was charged especially with being rash and arbitrary in his actions and these attacks led to his resignation of his office in 1916 The British government rewarded him for his services by creating him a Knight Commander of the Bath

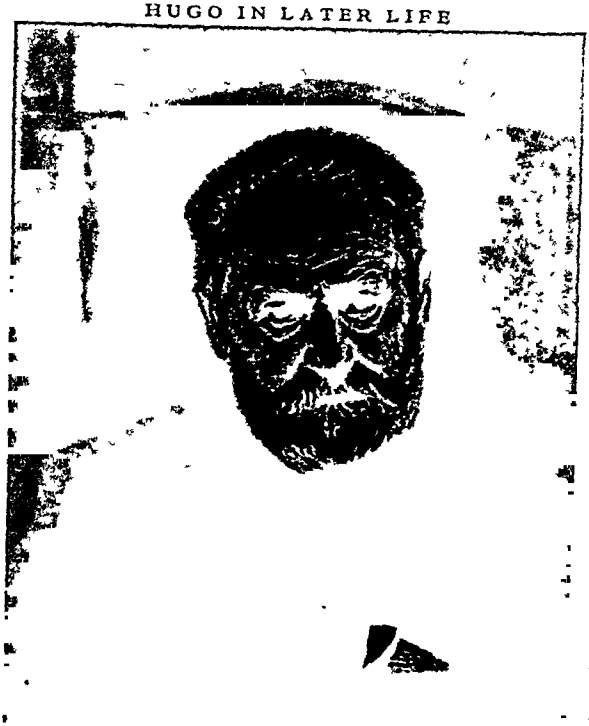
HUGO, MASTER *of* POETRY *and* ROMANCE

HUGO, VICTOR (1802–1885). On June 1, 1885, Paris celebrated the most magnificent funeral of the century. In a pauper's hearse, the remains of Victor Hugo, the sovereign poet of France, were carried for burial to the Panthéon. The pauper's hearse, which Hugo had requested in his will, was a symbol of his brotherhood with *les misérables*, "the unfortunates."

In his life, however, Hugo had enjoyed worldly success and fame without a parallel among writers. "No one," said Émile Montegut, "has stirred so much wrath, furnished pretext for so many literary civil wars, roused such fanatical enthusiasms, kindled such unshakable devotions." Once in his hearing, regret was expressed that Paris was not rechristened *Hugopolis*. "That will come," malice reports Hugo to have said. Such was the extravagance of Hugo-worship at the time of his death, that his enterprising valet was able to sell four hundred pairs of trousers that he swore had all been worn by Hugo.

There was an imperial vigor about the man and his manifold works. He ate his meat almost raw, he liked to bathe in ice water, and in his 83 years he never lost a tooth. His will was iron, and his capacity for work was incredible. "Take a moment's rest? Impossible!" he used to say. "A little work bores me, but much work is a pleasure." For more than 60 years he worked, prodigiously and with frenzy.

HUGO IN LATER LIFE



The poet's "imperial vigor" plainly appears in this portrait, painted when he was in his seventies. His snowy-white hair and beard frame his "lion's face," as admirers called it, with its wide and lofty forehead—"one of the finest laboratories of thought in the world." He had a powerful body that rarely knew fatigue or illness.

Parentage and Early Years

Victor Hugo was born at Besançon in eastern France, Feb. 26, 1802. On his mother's side he sprang from shipowners; on his father's, from a carpenter. Between his mother, who was a professed royalist, and his father, who was a supporter of Napoleon, there was a lack of understanding that ended in a separation when Victor was in his teens. From his mother, whom he adored, Victor learned to waste little love either on Bonaparte or on his father, Gen. Joseph Léopold Hugo, who was an officer in Napoleon's army. During the early years of Victor's life, while his father was fighting or doing garrison duty here and there, Madame Hugo was in Paris with her three sons—Abel (born 1798), Eugène (1800), and Victor. His fifth year was spent in Italy with his father, who was now governor of a province and chief adviser to Joseph Bonaparte, Napoleon's brother.

Barely had the Hugos begun to get settled in Italy when Napoleon conferred upon Joseph Bonaparte the crown of Spain General Hugo went to Spain with him, and Madame Hugo took her boys back to Paris. There she rented a roomy old house with a huge garden full of trees. This property, once part of the ancient convent of the Feuillantines, had run wild. It was as if it had slipped out of the covers of some Gothic romance and dropped there by some caprice of enchantment In this enchanted garden, Victor had for playmate a little girl, Adèle Foucher, who later was to be his wife.

Meanwhile, in Spain, Victor's father also was living in a kind of fairy tale. Overnight he had been created general of the staff, governor of Madrid, Count of Cifuentes and Marquis of Siguenza. The King had given him a million réals and a magnificent palace. He summoned his family to share his splendor. Abel, the eldest son, became a page at the king's court. Victor, who was now nine, and Eugène, two years older, were entered in a school for young Spanish nobles. Hated as enemies and despised as heretics, the two boys passed several unhappy months in this dreary place.

Reversal of Family Fortunes

It was the defeat of Napoleon's armies in Russia (1812) that broke the nightmare, and released Eugène and Victor to return with their mother to their beloved home in Paris. The same upheaval left General Hugo a poor man, stripped of his titles and reduced in rank. Madame Hugo gave up their beloved garden home and moved into a shabby apartment. The boys were sent off to school. For the next three years Victor enjoyed the only systematic education he ever had.

At school Victor not only distinguished himself in his studies but found time to read deeply in literature and to write thousands of lines of verse When he was 15 the French Academy gave him honorable mention in its annual poetry competition After leaving school at 16 he devoted himself entirely to literature The next year he won two prizes in a poetry contest at Toulouse With his elder brother Abel he founded and edited a literary review Most of the articles and poems were written by Victor himself

The heartbreak of his mother's death (1821) the hurt at his father's absence from the funeral and his own lack of means did not break his determination to live—or die—by his pen He continued to write His first published volume of poems (*Odes et Poésies diverses*) pleased the King and won for him an annual pension of 1 000 francs ($200) that later was doubled It also brought a profit of 700 francs Then at 20 he married his childhood playmate Adele Foucher

Poet of Hearth and Home

Marriage brought him four children whom he adored (not counting the first infant that lived only a few months) There was Léopoldine who from the first hour of her life was her father's darling and whose death by drowning just after her marriage seared his heart There was the gay Charles who gave Hugo two grandchildren that he doted on in later life There was François-Victor whose translation of Shakespeare is still the best and most complete version in French And there was Adèle of delicate health but the only one of his children who outlived him No other Frenchman has written so much tender poetry of childhood and children the family and the home

Leader of the Romantic Movement

Out of the happiness of his early married life and the remembrance of the Spain of his childhood Hugo created a work which brought him spectacular acclaim and his first substantial earnings The hero of this lyrical melodrama Hernani is a bandit chief whose heart is passionately given to Doña Sol the daughter of an ancient race Unhappily Doña Sol is promised in marriage to her aged uncle Ruy Gomez Hernani wins her but their nuptial hour is the hour of their death

Hernani (1830) was Hugo's first great triumph It also marks an epoch in the history of French drama. At the time of its production the French theater was being strangled by a set of petty and artificial traditions Hernani rudely shattered the traditions and brought fresh new life into French literature Thus before he was 30 Hugo was the acknowledged chief of the literary rebellion called the Romantic movement

It was predicted that his flame would soon burn itself out but poems plays essays historical sketches and novels followed one another steadily for half a century more Hugo had such richness of imagination such splendor of language and such command of technique that he triumphed over serious faults of hastiness and extravagance

Hugo was tremendously in earnest as patriot and social reformer and many of his works are impassioned criticism of social and political injustice As a political opponent to Napoleon III whom he nicknamed Napoleon the Little Hugo made himself so dangerous that he had to flee from France

Twenty Years of Exile

In Brussels and on the island of Jersey Hugo found only temporary refuge After 1855 on another island in the English Channel he enjoyed a world wide celebrity as the Exile of Guernsey There he wrote notable historical papers poems that are ranked with the greatest achievements of French genius and novels that were translated into many languages

Always at the boiling point of fervor Hugo was often merely violent over the passing event but he was occasionally carried away by passion to the point of inspiration on themes of universal interest Les Misérables is justly ranked with the greatest novels of all countries in comparison with it Hugo's other novels dwindle into secondary importance

Though Hugo wrote a number of plays some of which were enthusiastically received at the time he does not now rate highly as a dramatist As a poet—especially a lyric poet—he is still honored as the greatest that France has produced Les Châtiments is a collection of his finest lyrical poems

After the fall of the empire of Napoleon III in 1870 Hugo returned to Paris where he lived as a popular idol His songs were set to music his interdicted play Le Roi s'amuse (The King's Diversion) was revived and he was the chief figure of the French Academy When he died (May 22 1885) at the age of 83 Parliament gave him burial in the Panthéon—an honor which had been accorded to no one for 75 years

Books by and about Hugo

Victor Hugo's principal works of fiction are Notre Dame de Paris (1831) Les Misérables (1862) Les Travailleurs de la mer (Toilers of the Sea) (1866) Quatrevingt-treize (Ninety three) (1874) *Poems and poetic dramas* Cromwell (1827) Marion Delorme (1829) Les Orientales (1829) Hernani (1830) Le Roi s'amuse (The King's Diversion) (1832) *Ruy Blas* (1838) *Les Châtiments* (1853) Les Contemplations (1856) La Légende des siècles (three series—1859 1877 1883)

Good biographies of Hugo are Victor Hugo by A M F R Duclaux (Holt 1901 o p) The Career of Victor Hugo by E M Grant (Harvard Univ Press 1945) and Victor Hugo a Realistic Biography by Matthew Josephson (Doubleday 1942 o p)

A Masterpiece of World Literature 'Les Miserables'

Victor Hugo was 60 and at the zenith of his power when he wrote his masterpiece Les Misérables (*la me-za-ra blă*) He was in exile in Guernsey, in protest to the world against Louis Napoleon's betrayal of the Republic and usurpation of monarchy In his democratic sympathies he was indignant at the misery that infests the

slums of great cities, and the great cost in social injustice, labor and sweat and heartbreak on which the superstructure of civilization is built. (*Misérable* is both a noun and an adjective, meaning "wretched," "unfortunate"; and the untranslatable title of Hugo's novel means something like "The Dregs of Society.")

'Les Misérables' is a study of French society in the first years after 1830, when Hugo was young. In the character of Marius, Hugo gives a picture of his own early manhood. The hero, Jean Valjean, is a convict on whom 19 years of prison life have branded an indelible scar. He steals the cherished silverplate of a benefactor; he seizes a small coin from a little chimney sweep. Repenting, he is transformed into a man of honesty and honor. Years later, he learns that an innocent man is accused of the theft that he thought he had atoned for by years of charity. After an agony of inner struggle, he gives himself up and is returned to a convict ship. He escapes, adopts a little seven-year-old waif, Cosette, and gives her a place in the sunshine. She and Marius later fall in love, and Jean Valjean faces the bitter realization that he must relinquish her. Out of devotion to her he risks his life to save Marius, who has been wounded in the revolution of 1832. In one of the most unforgettable scenes of the book, he carries the almost lifeless form of Marius through the underground sewers of Paris. Having assured happiness to these children of his choice, he dies neglected and broken-hearted.

Around this structure of plot, Hugo has created a work of immense richness and power that is less a novel than a prose epic. It has been called "a vast invention, beautiful, incredible, sublime, absurd, absorbing in its interest, a nightmare in its tedium." In any event, 'Les Misérables' was once voted by popular referendum the greatest novel in the world.

LITTLE COSETTE SEES A VISION OF BEAUTY



Here the little waif Cosette stands spellbound by sight of a lovely doll, while knowing only too well that such playthings were not for her. From such contrasts of beauty and misery, brought to life by masterly telling, Victor Hugo built his novel 'Les Misérables', a gripping story of life, love, and sorrow among the poor of France.

HUGUENOTS (*hū'gĕ-nŏts*). This name, given in the time of the Reformation to the French Protestants, was probably a corruption of the German word *Eidgenossen* (confederates). It was first applied to the Swiss Protestants, with whom the French Protestants had much in common. In their struggles for religious freedom the Huguenots were driven to become a political party, and even a "state within the state," headed by some of the greatest French nobles.

By the middle of the 16th century their numbers and influence had aroused the fears of the Catholic party and the powerful family of Guise. Eight separate religious wars followed. The first war began with an attack by the Duke of Guise and his followers on a congregation of Huguenots assembled for worship in a barn. The peace which concluded the third war was broken by the massacre of St. Bartholomew, the most dreadful of the many crimes that marked this era of religious and civil warfare. (*See* Coligny.)

The Huguenot wars ended in 1598 when Henry IV —who was formerly a Huguenot, but who later conformed to the Catholic church—issued the Edict of Nantes. The edict gave the French Protestants political rights, religious freedom, and the possession of certain fortified towns (*see* Henry, Kings of France).

LENDING A HELPING HAND TO ANIMALS IN TROUBLE







In the upper pictures Humane Society workers are helping a horse which is too *sick to stand*. Since horses usually are terrified and resist being helped the animal is bound with ropes (left). Then it is blindfolded and taken in a truck (right) for treatment elsewhere. In the lower picture a class of Boy Scouts is learning first aid for dogs. To prevent the dog from biting its mouth is tied.

Their fortresses were lost with the capture of La Rochelle in 1628 (*see* Richelieu Cardinal). Although the Edict of Nantes was in other respects confirmed the Huguenots were still harassed and persecuted from time to time.

When Louis XIV revoked the Edict of Nantes in 1685 all protection of law was withdrawn from the Huguenots. Although they were forbidden to leave France hundreds of thousands succeeded in escaping. They carried French arts manufactures and culture to England Germany the Netherlands and the American Colonies especially South Carolina New York and Pennsylvania. France was thereby the poorer like Spain after the expulsion of the Moors.

The famous opera Les Huguenots by Meyerbeer uses the tragic times of the Huguenot persecutions for its background. The hero and the heroine are killed in the massacre of St Bartholomew (*see* Opera).

HUMANE SOCIETIES. In April of each year Be Kind to Animals Week is observed the nation over. Schools parent-teacher organizations women's clubs and other societies join with humane societies to think about the protection of animals.

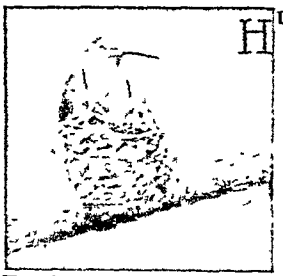
Organized interest in protecting animals began in England more than a century ago. In 1822 Richard Martin an Irish member of Parliament brought about the passage of an act to prevent the cruel and improper treatment of cattle. Two years later a Society for the Prevention of Cruelty to Animals was formed to enforce the Martin act and to help all other animals subject to abuse. After 1835 when Queen Victoria became a patron of the society its influence grew and societies were formed in many parts of the world.

Henry Bergh an American who became interested in the work of the British society while in London founded the first Society for the Prevention of Cruelty to Animals in the United States. It was incorporated in 1866 by the legislature of the state of New York.

In 1874 Bergh founded the New York Society for the Prevention of Cruelty to Children. This is said to be the first organized movement for the protection of children in the United States. A great step toward unifying the work was taken in 1877 with the formation of a national organization the American Humane Association which has for its object the protection of both children and animals. It succeeded in doing away with such abuses to cattle in shipment as overcrowding and *lack of food and water*.

Defenders of Furbearers was organized in Washington D C in 1946 to eliminate use of the cruel *steel trap*, to develop painless methods of capturing fur bearing animals and to encourage the public to purchase ranch raised instead of wild animal furs.

Humane societies promote laws to protect animals provide animal shelters and hospitals and conduct educational campaigns in the care of pets.



Here is mother rubythroat and her two babies in a nest in a pitch pine tree.

HUMMINGBIRD. Like a splendid jewel, the tiny hummingbird flashes across a garden at a speed the human vision is unable to follow. Exquisite in form and brilliant in its changeable coloring, this mite is the masterpiece of the whole bird family, though it is usually less than four inches long. This tiniest of birds does not sing, but squeaks like a mouse. Hummingbirds belong to the New World exclusively. There are about 750 species and subspecies, ranging from Alaska to Patagonia. The Andean regions of Colombia and Ecuador have the greatest variety of species. All have long slender bills—sometimes longer than the head, neck, and body together—tiny bodies, brilliant plumage, and marvelously developed wing power.

This extraordinary wing power is the result of the hummingbird's feeding habits. It feeds on the minute insects which loiter in the depths of flowers too small to support the weight even of so tiny a creature as the hummingbird. So it has developed very strong wings, which sustain it above the blossom, vibrating so rapidly that they make a humming sound and the eye sees them only as a filmy haze. To enable it to reach far into the deep flower-throats it has developed its long beak and its long tapering double-tubed tongue. This tongue can be instantly extended to an extraordinary length to seize insects in flowers or under the bark of trees. The common idea that the hummingbird lives exclusively on the nectar of flowers is a mistake. With the insects it of course gets some of the nectar, but it is the insects, not the nectar, that the bird is after. Like the bees, the hummingbirds are very useful in the cross-fertilization of plants, for bits of pollen cling to their bodies and are carried from flower to flower.

The nest of a hummingbird is a tiny cup-shaped affair, such as a fairy might build, and it is made of quite fairy-like material, plant-down, stuccoed with moss and spiderwebs. The eggs are pure white and never more than two in number.

In that part of North America bounded by the Mississippi and the Atlantic, Florida and Labrador, only one species of hummingbird is found. But during the summer months that one, the rubythroat, is everywhere present. The male measures a trifle under three and one-fourth inches from the end of its bill to the tip of its tail, and the female is nearly four inches long. The upper feathers of the male are the glistening green of an emerald, with changeable amethyst lights over the wings and tail. The under feathers shade from pearl-gray into the darker upper feathers, and the throat is like a glowing ruby, with all its variations of color. The females are more soberly clad. (For illustration in colors *see* Birds.)

Yet for all his splendor, the little fellow is very friendly with his human neighbors and likes to perch about their gardens, calmly preening his feathers, quite unconscious of the delight afforded by the sight of such a performance. Despite its tininess, the hummingbird is a fierce little fighter and will even rout a hawk or crow that ventures too near its nest.

In the rubythroat and also some other species, the little buglike babies are fed with food the mother bird has partially digested and which she pumps through her bill into the mouth of the fledgling.

Most of the rubythroats, from as far north as Alaska, winter in southern Mexico or Central America. After migrating to the Southern states, these tiny birds some autumn night launch out across the Gulf of Mexico, straight for their winter home 500 miles distant, and, incredible as it may seem, the trip is made without stop for food or rest.

West of the great plains of the United States, a number of other species of hummingbirds are found. Among them, California has the Anna's hummingbird, and one of the western species, the rufous hummingbird, is found as far north as Alaska.

Many of the species found in the tropical districts are even smaller and more remarkably clothed than the rubythroat, for in addition to the brilliant metallic plumage, they have various feather adornments. Of these the most remarkable are the "double-crested," with its growth of amber-like feathers over each eye, and the "tufted-neck," with a wonderful red crest and long green-spotted tufts of red feathers extending from either shoulder.

SPEED CAMERA STOPS HUMMINGBIRDS' WINGS



This remarkable photograph was made by the high-speed stroboscopic camera invented by Prof. Harold E. Edgerton and his associates of Massachusetts Institute of Technology. Taken at 1/100,000 of a second, the picture arrests the motion of those tiny wings, which average 55 strokes a second.

The hummingbird family is known as the *Trochilidae*. Scientific name of rubythroat, *Archilochus colubris*.

The Days of CRECY, POITIERS, *and* AGINCOURT

A War that Ravaged Europe for More than a Century—What It was All About—The "Black Death" Pestilence that Stalked on Its Heels—How Joan of Arc Drove Out the English

HUNDRED YEARS' WAR (1337 1453) On the side of a little hill near Crécy in northern France, an English army under King Edward III lay drawn up in three orderly divisions late one August day in 1346 On the plain below, outnumbering the English five to one, was a confused di orderly host of mounted French men at arms and hired Genoese crossbowmen on foot, under the French king, Philip VI

Suddenly the Genoese advanced to the attack But they were tired with a long day s march, and their crossbow strings were loosened by the wetting received in a terrific thunder shower Although they "shot fiercely with their crossbows ' they were no match for the more rapid shooting of the English longbowmen whose shafts fell so thick that it seemed snow" When the Genoese saw the arrows fall ing thick among them they cast down their bows and fled At this King Philip flew into a rage and cried out, "Slay these rascals for they will trouble us without reason! Whereupon his men at-arms dashed in among the Genoese and slew a great number of them

And ever still," says the chronicler Froissart "the Englishmen shot where they saw the thickest press The sharp arrows pierced the knights and their horses, and many fell, both horse and man And when they were down they could not rise again the press was so thick that one overthrew another '

In one place the French managed to reach a band of dismounted English knights commanded by the Black Prince, the 16-year-old son of Edward III In haste a messenger was dispatched by the knights asking aid but when their request was made known to the king, where he watched the battle from the tower of a windmill he inquired "Is my son dead, or hurt or felled to earth? ' No, sire said the messenger but he is overmatched and has need of aid ' "Then replied the king return to them that sent you and say to them that they send no more to me, so long as my son is alive and also say to them that they suffer him this day to win his spurs, for I will that this day s work be his, and the honor thereof '

As darkness fell the remnants of the French army were fleeing in confusion, but the English lines remained firm in their position on the hill Thus the English army won at Crécy the first great land battle in the long Hundred Years' War with France

The war had started in 1337, and it did not finally close until 1453 The causes of the conflict were to be found in the constant clashes growing out of the English holding of Guienne as a fief from the French crown, in the aid given by the French to the Scots in their wars against the English, and finally in the interference of Philip of France and his vassal, the Count of Flanders, with the profitable wool trade of English merchants with the Flemish cities In addition there was the claim that Edward III himself was rightfully king of France because his mother was a sister of the late French king, while Philip VI was only a cousin, but the French assembly had decided that the throne of France could neither be inherited by a woman nor by one who claimed through a woman (miscalled the ' Salic law')

The conflict was really a series of wars, truces, and peaces lasting through the reigns of five English kings from Edward III to Henry V, and of five French kings from Philip VI to Charles VII At the time of the battle of Crécy the English had already

THE TRIUMPH OF THE LONGBOW AT CRÉCY



This p cture, from an old print shows clearly one of the decid ng features of the Battle of Crécy, in wh ch the French although outnumber ng the Engl sh five to one were so woefully defeated W th their powerful longbows the Engl sh archers not only outmatched the crossbowmen of the French but overwhelmed each ousla ught of the enemy cavalry before they could come to close quarters

won command of the English Channel by a spectacular naval victory at Sluys; and after Crécy, the town of Calais, the door into France, surrendered to them on Sept. 28, 1347, after a year's siege.

For almost ten years after that the fighting lagged. This was due in part to a great pestilence, called the "Black Death," which swept over Europe and carried off more than a third of the population (*see* Black Death).

Not until 1355 was the struggle between the two countries renewed. The English now carried the conflict into southern France instead of confining it to the northern section as before. At Poitiers (1356) the Black Prince with a small army of Englishmen was confronted by an overwhelming French force. In vain the Prince offered to surrender his spoils and his prisoners and to promise not to fight for seven years if he might be allowed a safe retreat. This offer was rejected, so certain did the French feel of victory.

The Longbows Win the Day at Poitiers

The Black Prince arranged his troops on a little plateau protected at the flanks by a hedge and by rough and marshy ground. The brave but inefficient French King John threw away his advantage of superior numbers by ordering his knights, weighted down with their armor, to dismount and advance on foot against the hail of English arrows. "There was a sore fight that day," says the chronicler, "and many a great stroke given and received." One after another the three divisions of the French army were thrown into confusion. King John and his youngest son, refusing to flee, were taken captive by the English. Again the victory was due to the new English weapon —the "longbow," with its "cloth-yard shaft"—and to the trained skill of the English archers.

The horrors of a peasants' revolt and civil strife were now added to the miseries of France. A treaty with England was finally concluded at Bretigny in 1360, by which King John was to pay a large money ransom, and Edward III was to have Guienne, Crécy, and Calais in full sovereignty. In return Edward III renounced all claim to the French crown.

But in 1369 the new king of France, Charles V, physically weak but intellectually strong, found an excuse for breaking the treaty and renewing the war. Aided by the able Breton general, Bertrand du Guesclin, he organized an army of professional soldiers instead of the medieval knights, and by cautious maneuvering brought one place after another into his hands. Only Calais in the north and Bordeaux in the south remained to the English at the time of Charles' death in 1380.

Victory of the English at Agincourt

For nearly a generation the war then languished, due to factional strife for power in both England and France. Soon after the accession of Henry V, the hero king of England, it began again. At Agincourt, near Crécy, a small English force was again confronted in 1415 by a large French army. The French, it seemed, had learned nothing from the disasters of Crécy and Poitiers or from the exploits of Charles V and Du Guesclin. As in the two former great battles, their forces consisted chiefly of dismounted knights weighted down with heavy armor. Again they were packed close together in a narrow newly plowed field between two woods in which they sank almost to their knees. Shakespeare makes Henry V say, the night before the battle, that he "wished not for a single man more" to share the glory. A third great English victory, equal to those of Crécy and Poitiers, was the result.

By the Treaty of Troyes (1420) the defeated and disunited French agreed that Henry V should marry Princess Katherine, the daughter of Charles VI of France; that during the life of this insane king, Henry should act as regent; and after Charles' death Henry should reign as king of France as well as England.

Henry V did not live to wear the French crown for he died seven weeks before Charles passed away (1422). The death of these two monarchs left the claim to both thrones to Henry VI, the nine-month-old son of Henry V and Queen Katherine.

The English claims in France, however, were disputed by the disinherited dauphin of France, later Charles VII, who refused to accept the Treaty of Troyes. For a time he was too weak to be feared and at the end of seven years it seemed that Orleans, his last considerable stronghold, would surely fall to the English.

The Wonderful Maid of Orleans

Just at this darkest moment in the fortunes of France, a new force appeared in the person of Joan of Arc, the Maid of Orleans (*see* Joan of Arc). Inspired by her patriotism the French forced the English to raise the siege of Orleans. Victory followed victory in rapid succession, until finally Joan led the dauphin through a hostile country to be crowned at Reims as King Charles VII. Even after Joan's capture and execution by the English and Burgundians her spirit seemed to inspire the French and to wake in them a new national sentiment. Little by little they drove the English back. Finally the war ended in 1453 with only Calais remaining in English hands.

Instead of winning the French throne for the English king, the Hundred Years' War had lost for him the last of those continental possessions which had once been held by Henry II. The French king no longer numbered a powerful rival monarch among his vassals, and soon established an almost absolute power in his kingdom. He enjoyed a permanent revenue and was supported by a standing army equipped with modern artillery—for cannon had come into use either at or since the battle of Crécy. In addition the hundred years' conflict to expel the foreigner from their soil had developed in French bosoms the root of that intense patriotism which today characterizes France. But against these gains for France must be balanced fearful losses inflicted upon its land and people, the check to population, and the brutalization of long-continued warfare.



Onward—forward—swords against the foe! On and on the lily banners go! This stirring painting by Lenepveu depicts the scene which marked the turning point of the Hundred Years War. Joan of Arc, holding high her white banner embroidered with the lilies of France, is leading the men of Orléans against the English who were in possession of the forts that commanded the city of Orléans. Joan's standard was looked upon as an omen of victory. When it touches the walls, she had said, we shall surely enter. And so it was. The English were driven from the forts, and Orléans was again free.

The Broad HUNGARIAN PLAIN *and Its* PEOPLE

HUNGARY (*hŭng'gă-rĭ*). Before the first World War Hungary shared with Austria the rule of the great empire of Austria-Hungary. This war cost Hungary three fourths of its territory. In the second World War Hungary again went down to defeat with Germany. In 1945 the Russian army moved in, and Hungary became a satellite of Russia. In 1949 the name was changed to the Hungarian People's Republic.

The Land and the People

The plain of Hungary is roughly oval in shape. It was once an inland sea. On the north it is ringed by the great arc of the Carpathian Mountains; on the west it reaches to the Austrian Alps. The Danube River enters it at the northwest corner and flows, first east, then south, down through the center of the country. A tributary, the Tisza, crosses eastern Hungary from north to south. Between these two rivers spreads a great flat basin known as the Alföld, or plain. A smaller plain, the Little Alföld, lies in the northwest corner, edged on the south by the highlands of the Bakony Forest. South of Bakony lies shallow Lake Balaton, the playground of Hungary. The Drava, another Danube tributary, forms part of the southwest boundary. The soil almost everywhere is rich and black.

Winters are very cold, summers hot and sometimes so dry that the desert mirage can be seen. Only in the Bakony Forest is there an extensive wooded area. The plains are bare of trees except for feathery American locusts, planted in straight lines along village streets, and willows and poplars bordering the rivers. The rain does not run off in small streams but collects in lakes and ponds, soaks into the soil, and joins the rivers underground. Wherever a well is sunk, it will find water.

The people of these broad plains are unlike those of any other European nation. They call themselves Magyars and their land Magyarorszag. Their ancestors came out of Central Asia a thousand years ago. Through intermarriage with Slavs and Germans they lost their Mongolian features. Yet they have remained a distinct people, clinging proudly to their traditions and their strange tongue. The only people in Europe whose speech at all resembles Magyar are the Finns and Esthonians. They, like the Magyars, are Finno-Ugrics.

Agriculture and Industry under Communism

Hungary used to be called the granary of Europe. Its rich fields produced a surplus of wheat, meat, and butter. The people sold food to western Europe and bought manufactured goods. Hungary is now behind the Communist Iron Curtain and its trade with the West is cut off. Surplus food goes to the army and the security police. In the cities meat has become a rarity and even bread has to be rationed.

Before the Communist régime, few peasants owned land. They worked for wages on large estates and lived in farm villages. Their houses were one story, long and narrow, with smooth, whitewashed walls. They raised wheat and sugar for market and corn and turnips to fatten pigs and cattle. For their own tables they grew rye, potatoes, vegetables, and grapes for wine.

The Communists dispossessed the rich landowners and divided the land among the peasants. The peasants welcomed the change; but they were soon asked to give up their small holdings and work on state-owned collective farms. They resisted, and production fell so low that the government was forced to slow down its program. But it did not abandon its goal.

Trade and all large businesses were nationalized, and plans were drawn up for heavy industry—a three-year plan in 1947 and a five-year plan in 1950. When production fell short of the goals, the government decreased wages and at the same time demanded greater output from each worker. In 1951 about 30,000 people who were considered "undesirable" were taken from their homes and sent to concentration and forced-labor camps.

Except for mining, industries are still based mainly on agriculture. Budapest, the capital, is the only large manufacturing city (*see* Budapest). Coal is mined at Pécs. Deposits of bauxite yield aluminum, and some oil, manganese, and iron are obtained.

Churches and Schools

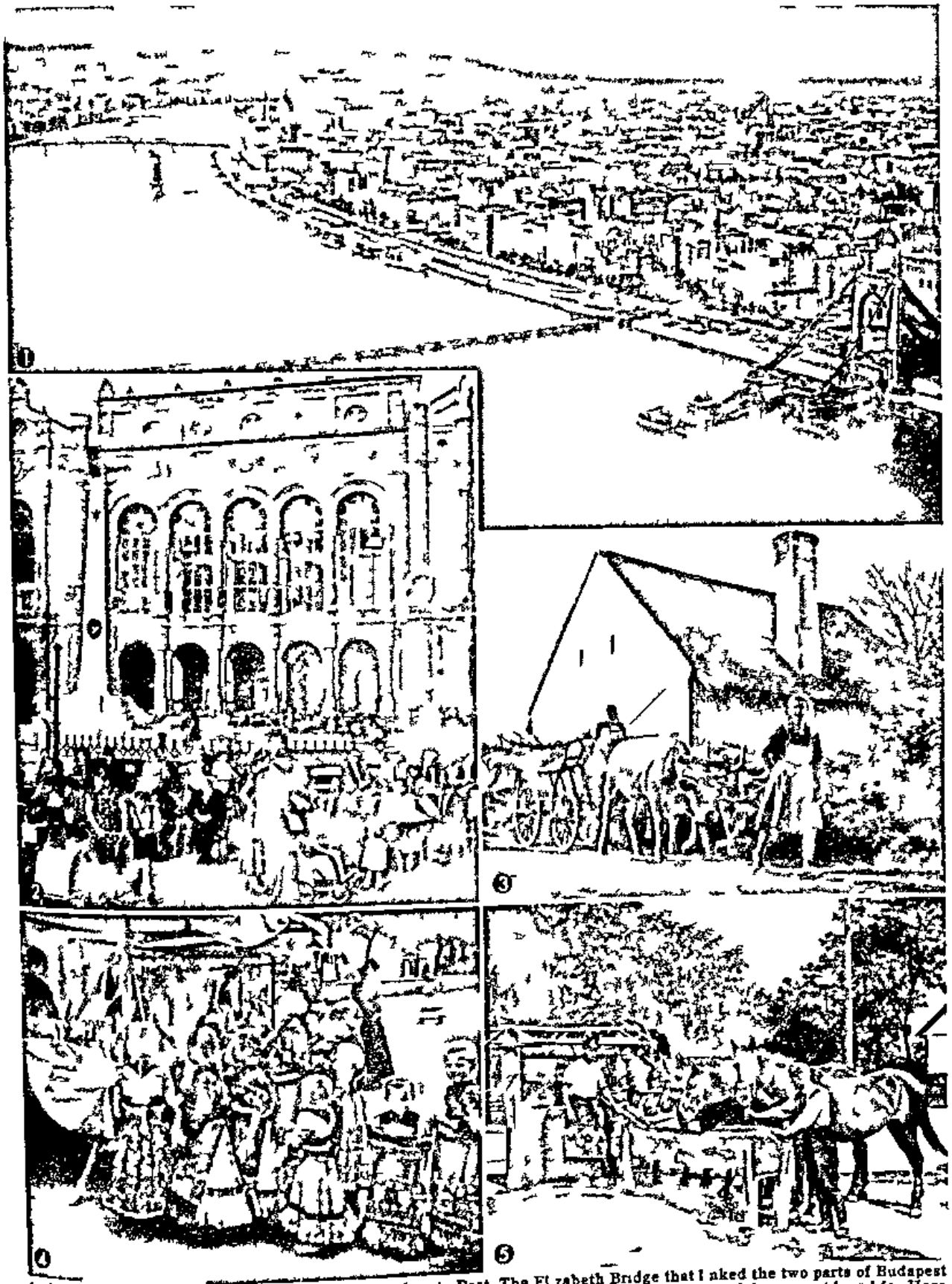
In 1941 about 65 per cent of the people belonged to the Roman Catholic Church. It was strongest in the west. In the east were Calvinists, Lutherans, Greek Orthodox, and Mohammedans. The government seized Catholic church lands and closed Catholic orders. In 1948 it imprisoned Cardinal Mindszenty, and in 1951 Archbishop Joseph Groesz.

Practically all education is now in "general schools" which are closely supervised by Communists. Education is compulsory for children of 6 to 14. The chief institutions of higher learning, except for the University of Budapest, are trade and technical colleges. All text books must express Communist views.

How the Scourge of Europe Became Its Shield

About A.D. 895 the Magyars rode through the Iron Gate of the Danube Valley with their herds of long-horned cattle and pitched their tents on the grassy plains. For half a century they ranged far and wide, like their predecessors the Huns, carrying off loot and slaves to their homes. Finally Otto the Great assembled a force in Bavaria and subdued them in the battle of Lechfeld (955). The Magyars then settled down and began to till the soil.

Surrounded by hostile peoples, it seemed unlikely that this small outpost of Asia could survive in the heart of Europe. It was saved from extinction by its first great king, Stephen (977?–1038), who welded his unruly pagan tribes into a nation. He appealed to the Church of Rome for protection and set up bishopries and monasteries to Christianize his subjects. The pope gave him a crown for his services. After his death he was canonized. The Holy Crown of St. Stephen was stolen by the Nazis during the second World War and recovered by the United States Army.



1 F om Buda left we look ac oss the blue Danube to Pest The El zabeth Bridge that l nked the two parts of Budapest hes n war ru ns at lowe right Bes de t is a tempo ary pon oon bridge 2 Budapest s famed for s outdoor l fe Here Hungarians of all ages elax on a w de con ou se 3 Some country d s ricts still use oxcarts 4 A child en s ma ket is held n Mezókövesd noted for its p cturesque cos umes 5 Many Mezókövesd men l ke these farme s also wear colorful garb

In the 13th century Mongol hordes followed in the footsteps of the Magyars, ravaged their lands, then disappeared into Asia (*see* Mongols). In the 14th century Hungary rose to a dominant position in the northern Balkans, and in the 15th century its king Matthias Corvinus extended his rule north of the Carpathians. But in the midst of this Golden Age, Hungary became involved in a long and exhausting struggle against the Turks. Defeated at Nicopolis in 1396, the Magyars rose again under their great leader John Hunyady and in 1456 pushed the Turks back to Constantinople. At last, in 1526, in the famous battle of Mohacs, the Hungarian army was annihilated and its king perished.

The Hungarian diet now elected Ferdinand I, archduke of Austria, to the throne. But the area left to him was only a small half-moon in the northwest corner. A Turkish pasha established himself in Buda and ruled the richest part of the country. After an exhausting 20-year war of liberation at the end of the 17th century, Hungary finally threw off the oppressive Turkish yoke. But it was still not free—merely an eastern province of the powerful Austrian empire.

Partner in a Great Empire

Revolts against Austrian rule culminated in the great rebellion of 1848–49, which was crushed by the joint efforts of Austria and Russia. The leader of the rebellion was Louis Kossuth, whose name is revered in Hungary as a symbol of liberty. Through his efforts serfdom was at last abolished. But the land still remained in the hands of a large aristocracy, and the peasants continued to live under feudal conditions.

In 1867 Austria made peace with Hungary by allowing it an equal partnership in a Dual Monarchy (*see* Austria-Hungary). This arrangement failed to satisfy the Slavic peoples who lived on Hungary's borders. When the first World War shattered Austria-Hungary, they broke away, leaving Hungary with only a third of its former territory. Slovakia in the north went to Czechoslovakia, Transylvania in the east to Rumania, and the Slav lands in the south to Yugoslavia.

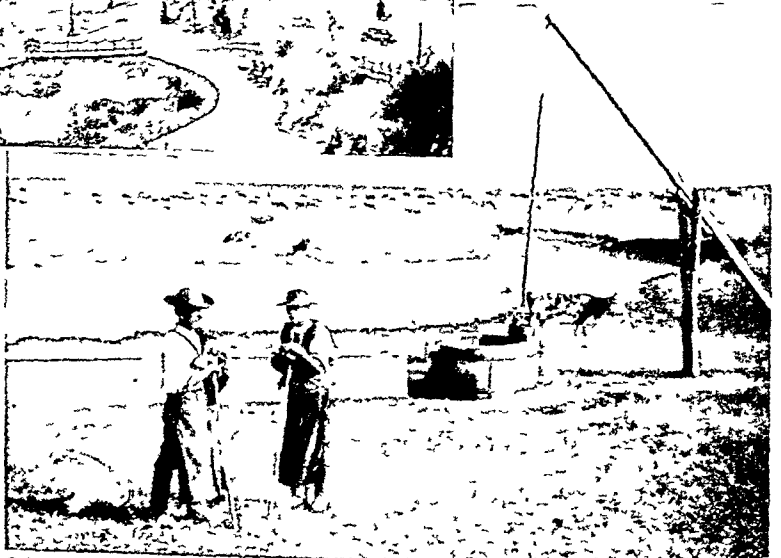
A Monarchy without a King

In 1918 Hungary proclaimed itself a republic. In 1919 Bela Kun, a young Communist war veteran, seized control and proclaimed Hungary a Soviet republic of Russia. But he had scant support and his Communist rule collapsed when Rumania invaded. Admiral Nicholas Horthy, Conservative, then won power. Although Hungary had no king, Horthy "restored" the monarchy and established himself as regent, guardian of the Holy Crown.

Hungary now tried to regain its lands. It looked first to Italy for aid, but as Germany rose to power

CONTRASTING SCENES IN HUNGARY





Splendid parks, tree-shaded boulevards, and vistas of architectural charm made Budapest, Hungary's capital, one of the beauty spots of Europe. In this view through Liberty Square (above) we see the Parliament Building in the background. This area in Buda, on the high western bank of the Danube River, was shattered when Budapest was besieged by the Russians in 1945. Below we see a typical rural scene, with herders guarding cattle in the communal pasture. Should the pond where the cattle drink dry up, the well sweep stands ready to fill the watering trough from the shallow well.

Hungary turned increasingly toward the Nazis In 1939 it signed the anti-Comintern pact Hitler rewarded it with eastern Czechoslovakia then in 1940 with a slice of Rumania and in 1941 a strip of Yugoslavia In all Hungary nearly doubled its area

On June 26 1941 Germany forced Hungary to enter the second World War Hungary was an unwilling ally and suffered huge losses fighting against Russia As the Russian army drove near in 1944 Hungary bid for peace but was occupied by Germany Hungary's countryside suffered little damage in the swift Russian advance but Budapest suffered serious damage (*See also* World War Second) Russian troops remained and enabled the Communist minority to seize power In 1946 Hungary became a republic A new constitution on the Russian model (1949) changed the name to the Hungarian Peoples Republic In 1953 the number of members in parliament was cut to only 298 presumably to get a centralized regime like Russia's new collectivism

The peace treaty of 1947 nullified Hungary's territorial gains Area 35 912 square miles Population (1949 census) 9 204 799

HUNS A writer of the early Middle Ages pictured the savage wandering Huns of his time as 'men little in size but quick and active They live largely on half raw animal flesh which they merely warm by placing it between their own thighs and the backs of their horses On horseback every man of the nation lives day and night On horseback he takes his meat and drink and when night comes he leans forward on the neck of his horse and there falls asleep Other historians testify that the Huns often lived up to the fearsome picture that this ancient writer painted of them

In 374 A D the Huns crossed the Volga River and entered Europe for the first time from their homes in Central Asia They conquered the Ostrogoths, and driving the Visigoths across the Danube occupied the region north and west of the Black Sea There they lived for more than 70 years before they began their second and greater wave of invasion In 451 under Attila the scourge of God they swept into Germany and crossed the Rhine into what is now France laying waste the country with fire and sword In a bloody battle near Chalons Attila was defeated by a combined army of Romans and Visigoths under Aetius and forced to retreat The next year the Huns descended into Italy devastating the country They would probably have taken Rome had it not been for the bravery of Pope Leo I In an interview he so overawed the fiery Hun that Attila spared the city and withdrew from Italy With the death of Attila in 453 the empire of the Huns which included all the peoples from the Volga to the river Rhine quickly fell to pieces The remnants of Attila's following either went back to Asia or mingled with the peoples they had subdued Their great leader lived on in German legend as Etzel (*see* Nibelungs Song of the) The Magyars who several centuries later crossed the Carpathian Mountains and settled what is now Hungary were related to the Huns

The Ancient SPORT *of* KILLING GAME

HUNTING The practice of hunting for game began as a means of supplying food The Indians of North America and other primitive groups obtained much of their food by killing buffalo bear deer and waterfowl During pioneer days the frontiersmen also depended largely upon wild animals and birds for their meat Later as farming and stock raising spread across the continent hunting ceased to be an important means of livelihood Today it is primarily a sport

Through the years the number of licensed hunters has steadily increased until now there are more than 13 million in the United States The growing number of hunters once threatened to wipe out the game supply Since the late 1930's however sound conservation practices have been keeping the population of many species of game at a high level despite increased hunting pressures One of the best examples of conservation is the work being done by an organization of hunters called Ducks Unlimited (*see* Duck) To protect the present game supply hunters should follow the principle that guided the Indians Kill only the game you want for food never waste it

The four major types of hunting in the United States are—upland game waterfowl big game and pest (varment) Upland game includes rabbits squirrels quail pheasants grouse and woodcock Geese and ducks are the favorite waterfowl targets Big game hunters stalk deer bear elk antelope moose and mountain sheep and goats Pest hunting may be coyotes in the West crows on the farm or woodchuck (groundhog) almost everywhere

Rules of Safe Gun Handling

The chief firearms used by hunters are 22-caliber rifles large caliber rifles and shotguns (*see* Firearms) All these are deadly weapons and should not be handled unless certain rules of gun safety are followed Nine basic rules are

1 Treat every gun as if it were loaded

2 When entering an automobile home or camp carry a gun with the action open or taken apart

3 Be sure the gun barrel is free of obstructions

4 Carry a gun so that the direction of the muzzle can be controlled even in falling

5 Be sure of the target before pulling the trigger

6 Never point a gun at anything except in shooting

7 Never leave a gun unattended without first unloading it

8 Never climb a tree or fence with a loaded gun

9 Never shoot at hard flat surfaces or the surface of water

Hunting with a Rifle

The first firearm that most hunters learn to use is the 22 caliber rifle This gun serves best for

shooting rabbits and squirrels. It is also a fine weapon to use on crows, woodchucks, and other animals that are hunted for sport or as pests and not primarily to eat. These rifles are most commonly made in four styles: single shot, pump, bolt action, and automatic. All can be used in the field or on a target range (*see* Riflery).

For larger game, the most popular rifles are the .270, .30, and .375 calibers. The basic styles are: pump, bolt action, and automatic. These rifles are used chiefly for hunting bear, deer, elk, and other big game found in forested or mountainous country. Heavier caliber rifles are sometimes used for shooting elephants, rhinoceroses, and other big game hunted in Africa and elsewhere.

Hunting with a Shotgun

Upland game and waterfowl are hunted with a shotgun. There are six types of such guns: single barrel, single shot; side-by-side double barrel; over-and-under double barrel; bolt action; pump; and automatic. There is also a choice of shotgun gauges ranging from the small .410 inch bore through the heavy 10-gauge guns. For most hunters, the 20-, 16-, or 12-gauge guns are best.

Selecting the proper choke and the correct barrel length is important. The *choke* means that certain barrels are constricted (tapered) at the front end with the amount of this constriction designated as choke. It varies from a true cylinder (which has no choke) to modified and full choke. The cylinder barrel tends to spread the shot pattern of the pellets. The more a barrel is choked, the smaller the shot pattern becomes. A full choke barrel makes the smallest pattern, holding the pellets closer together at any given distance. Mechanical choking devices permit the hunter to use a variety of chokes on a single barrel.

For quail and rabbits, where shooting is at close range and in brushy country, the cylinder choke is best. Usually, a barrel length of 26 inches serves well with this choke. For shooting pheasants, waterfowl, grouse, and other game at long ranges, the full choke barrel works more successfully, and barrel lengths of 28 or 30 inches are recommended. Actually, a longer barrel does not give a hunter much additional killing range, but it does make sighting easier.

A shotgun should feel comfortable to the shooter if accurate gunning is to result. The stock may be shortened or lengthened to fit the shooter's shoulder. Another important point is the weight of the gun. A hunter must be able to throw the gun quickly to his shoulder and swing it with the target fast and accurately.

Other Types of Hunting

Some hunters find greater sport in killing game with a bow and arrow rather than with a firearm. If properly used, this weapon is as deadly as a rifle.

Much of the fun of hunting comes from just being in the fields or lowlands enjoying nature. Many hunters add to their pleasure by using a hunting dog. A well-trained dog can find game that would escape

HUNTING GAME WITH SHOTGUNS



Killing upland game birds requires quick and accurate shooting. Here a hunter is getting a grouse with a well-aimed shot.

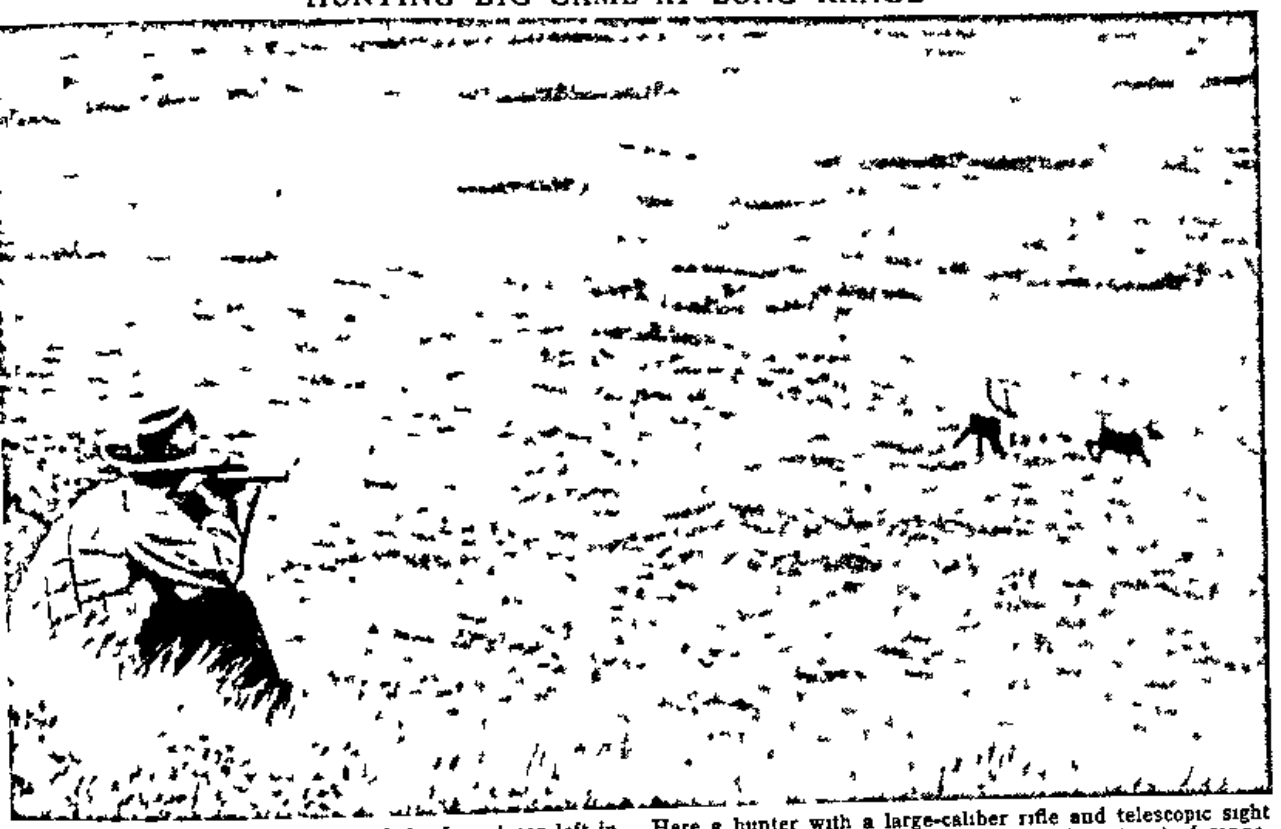


Duck hunters must be patient as well as good shots. They often find a good hunting spot and then wait for a flock to appear.



In some states there is a prize, or bounty, offered for killing coyotes. This hunter is trailing a coyote with the help of two dogs.

HUNTING BIG GAME AT LONG RANGE



The Rocky Mountain region is one of the few places left in the United States where a variety of big game may be found

Here a hunter with a large-caliber rifle and telescopic sight draws a bead on two caribou scurrying to get out of range

a hunter's eye Most dogs also make good retrievers of killed or crippled game (*see* Dogs)

Laws Governing Hunting

The federal government and all state governments have passed laws to conserve the supply of game birds and animals In general migratory game birds are protected by federal law other forms of game by state laws These regulations prohibit the killing of game except during *open seasons* The exact dates of these hunting seasons vary from state to state and sometimes by zones within states Other regulations govern the method of taking game the amount of game that can be killed in one day and the amount of game that a hunter may have in his possession

All states issue hunting licenses which may be purchased for a fee Federal law requires the purchase of a migratory bird (duck) hunting stamp in addition to the state license

Obeying the Rules of Hunting Etiquette

Every hunter can add to his own enjoyment and the pleasure of others by following the simple rules of good hunting etiquette Some of these rules are

1 Never hunt on a farm without asking permission from the owner If possible, park your car in the farmer s yard

2 Close farm gates after passing through An open gate may allow livestock to escape

3 Do not damage the crop by walking through a newly planted field

4 Be careful not to damage fences in crossing

5 Respect all signs They were put up for a purpose

6 If hunting with a dog that belongs to a companion never try to give the dog commands Let its master do this

7 Always give a companion the "breaks in shooting It is customary to alternate in shooting single birds

8 Never be a 'claimer" If another hunter shoots at the same bird give him the benefit of all doubt and say he killed it

9 Offer to share your game with the farmer who gives permission to hunt on his land

10 Remember the rules of safe gun handling Careless and thoughtless gunners are not welcomed as hunting companions

HURON, LAKE The second largest of the Great Lakes Huron has an area of 23 010 square miles including Georgian Bay Its greatest length is 206 miles and its width 183 miles Its shape is so irregular that a line from the head of Saginaw Bay to the far shore of Georgian Bay is nearly as long as the lake itself Its level and its depth are about the same as those of Lake Michigan, with which it connects through the Straits of Mackinac Its surface is 580 feet above sea level Its greatest depth is 750 feet Huron s ports are of secondary importance However the lake is a great highway for ship traffic despite the mountainous waves which 'northeasters' drive upon its western shore Such waves make Saginaw Bay feared by mariners at the end of the season

The most beautiful scenery of all the Great Lakes is in Georgian Bay, a great arm of Huron, 120 miles long and 50 miles wide. It is separated from the lake to the north and east by the long island of Manitoulin. One of the most picturesque water voyages in North America is a trip through the North Channel, between Manitoulin and the rocky bluffs of the Ontario mainland, and among the "Thirty Thousand Islands" that strew the northern half of the bay. Georgian Bay is one of the most popular vacation spots of the continent, and hundreds of cottages and hotels have been built on its islands to accommodate summer visitors.

The Trent Canal, between the southeast end of Georgian Bay and the Bay of Quinte, near the eastern end of Lake Ontario, was designed to provide a shorter water route for shippers between the St. Lawrence River and the Lake Superior-Lake Michigan region. As it permits a draft of only six to eight feet, it is too shallow for large vessels (*see* Canals).

Through the St. Clair River, Lake St. Clair, and the Detroit River, the waters of Lake Huron flow into Lake Erie. The passage between the lakes is continually dredged keeping open a channel of fixed depth.

HUSS, or **HUS**, **JOHN** (1369?–1415). On the shore of Lake Constance in Germany, July 6, 1415, John Huss was burned at the stake as a heretic and his ashes thrown into the Rhine. He had died rather than recant his religious views and criticisms of the clergy. Like John Wycliffe, the English priest whose doctrines Huss largely followed, the frail determined Huss served as a forerunner of the great religious revolt called the Reformation (*see* Reformation; Wycliffe).

Huss was born of humble parents in the little Bohemian village of Husineç. He was christened Jan or John and was later called *John of Husineç* or, in shortened form, John Huss or Hus. In preparation for the priesthood in the Roman Catholic church—the only religion at that time in Western Europe—he entered the University of Prague. After graduation he lectured there on philosophy. For a time he was a rector of the university. He also supported the Bohemians' protest at the undue influence of Germans in the university. The protests led the German masters and scholars to secede in 1409 and found the rival University of Leipzig.

At the time of Huss, European scholars wrote in Latin, the universal language for learned men in all nations of Europe. Huss, however, also wrote his beliefs in his native Bohemian (Czech) tongue, and so became one of the founders of Bohemian as a literary language. His powerful sermons, preached in Bohemian, won the trust and affection of the people, and many became his devoted followers.

Early in his priestly days Huss had been attracted by the religious and philosophical writings of John Wycliffe, who denounced irregularities among the clergy. As told in the article Reformation, evil practices had grown up among some of the clergy despite efforts of the church to root them out. Huss carried on Wycliffe's strong protests and was long supported by the bishop of Prague. Huss's vigorous campaign, however, also won him many powerful enemies, especially in the church.

JOHN HUSS



This Bohemian priest-critic had great influence on Luther and the Reformation

Huss did not follow all the beliefs of Wycliffe, who had been denounced as a heretic. For example, Huss did not reject the church's doctrine of transubstantiation. Nevertheless, when he opposed the burning of Wycliffe's books, he was charged with heresy and forbidden to preach or to teach.

This was the troubled time of the Great Schism in the church (1378–1417), caused by rival claims to the papacy. (For names of rival popes, *see* table in the FACT-INDEX, titled Popes of the Roman Catholic Church.) When one of the popes, John XXIII, proclaimed a crusade against his rival, the King of Naples, and promised indulgences to volunteers, Huss attacked this procedure. His followers burned the pope's *bull* (papal decree). The church excommunicated him and laid an interdict on any place that would shelter him. Friendly noblemen defied the interdict and housed him while he turned to writing.

In 1415 the Council of Constance met to heal the Great Schism and to discuss reforms in the church. To justify his views, Huss got a safe-conduct to the Council from the Emperor Sigismund. At Constance, Sigismund ignored his safe-conduct pledge and had Huss arrested as an excommunicated heretic and thrown into prison. He refused to recant his teachings, declaring, "I am prepared to die in the truth of the Gospel which I taught and wrote." His views later greatly influenced Luther (*see* Luther).

Huss met his tragic death steadfastly, as did his disciple, Jerome of Prague, a year later. Rather than putting down heresy, the death of Huss made his beliefs the national religion of Bohemia. To Bohemians, he became their "hero, martyr, and saint."

His death inspired the bitter, often savage Hussite Wars (1419–34). These were the struggles by Bohemians for national, religious, and social revolution. Time and again they threw back the combined forces which European nations sent forth as "crusades against Hussites and all heretics in Bohemia."

HUTCHINSON, ANNE (1591–1643). In colonial New England, the Puritan leaders demanded strict obedience to both church and civil laws. Anne Hutchinson was one of the first to challenge their absolute authority in religious matters. Her protest helped to establish the American principle that each man can worship in his own faith. For her rebellious act, Anne Hutchinson was banished from the Massachusetts Bay Colony. She spent her last years in New York. Her life ended in tragedy. She and her children were massacred by Indians.

Anne Marbury Hutchinson was born in Alford England She was baptized on July 20 1591 Her father Francis Marbury was an English minister Twice he was imprisoned for his fearless preaching against the established Church of England Although Anne had no formal education she learned much by listening to her father and his friends talk of religion and government When Anne was 14 her father was appointed to St Martin s Church in London

At 21 Anne married William Hutchinson her childhood sweetheart and they returned to Alford to live They had 14 children Despite her busy household affairs Anne Hutchinson was active in religious interests She often made the 24-mile journey to Boston England to hear John Cotton preach In 1633 Cotton was forced to leave England because of his Puritan sympathies With Anne s eldest son Edward he fled to New England Anne William and the other children followed the next year and settled in Boston Mass

Soon Anne Hutchinson held weekly prayer meetings for the women of the colony At these meetings she often criticized the preaching of the clergy Anne believed that the Lord dwelt within each individual She felt that faith alone would win salvation This was opposed to the teachings of the Puritan fathers (*see* Massachusetts) By 1636 Anne had made many converts Among the most influential were her brother in law Reverend John Wheelwright and the young governor Henry Vane John Cotton also supported her at first but he later publicly renounced her teachings

THE PURITAN FATHERS PASS JUDGMENT



Firm in her faith Anne Hutchinson hears the sentence of the General Court banishing her from the Massachusetts Bay Colony She was accused of preaching beliefs contrary to established church doctrine

With Governor Vane a convert the other magistrates and clergy feared civil disobedience and tried to regain control of the government When Vane returned to England in 1636 they obtained the governorship for John Winthrop At once he banished Wheelwright to New Hampshire and brought Anne to trial Despite her spirited defense she also was banished in November 1637 Due to ill health she was permitted to spend the winter in near by Roxbury Mass

Twice during the winter Cotton and other clergymen tried to get Anne to deny her beliefs When she refused she was formally excommunicated from the church With her family Anne moved to Aquidneck RI in the spring of 1638 There with friends she founded a new colony and remained until her husband s death in 1642 Then she moved with her younger children to Pelham Bay in New York Late in the summer of 1643 a band of Indians massacred the entire family with the exception of one daughter The little girl was captured and later ransomed to the Dutch

HUXLEY, THOMAS HENRY (1825–1895) The foremost British champion of Darwin s theory of evolution was Thomas Henry Huxley This great teacher and biologist brought the findings of science to the whole nation by lecturing and writing in language that all could understand Today his essays and speeches are still read for their clarity and ease in expressing complex scientific facts and ideas

Thomas Huxley son of a schoolmaster was born at Ealing on May 4 1825 For a few years Thomas attended his father s school but then George Huxley stopped teaching and moved his family to Coventry This ended Thomas formal education for a time although he continued to read widely Two brothers-in law were doctors and they excited the boy s interest in medicine At 16 he was apprenticed to one a London physician In 1842 he entered London University The same year he and his older brother won scholarships to Charing Cross Hospital At the hospital Thomas gained a wide knowledge of comparative anatomy He also discovered a layer of cells in the root sheath of the hair now called Huxley s layer

After graduation from the university in 1845 Huxley was appointed a surgeon in the British navy and served on *H M S Rattlesnake* He made many valuable studies of sea creatures during a voyage to the Torres Straits in 1846–47 One was On the Anatomy and Affinities of the Family of Medusae which was to

furnish a most important link in the theory of evolution. This was before the publication of Darwin's 'Origin of Species', but Huxley here gave the first hint of the now widely accepted theory that the growth of a highly developed creature from embryo to adult is a hurried retelling of the story of the evolution of that species.

Darwin said that Huxley was one of the three men in England whom he needed to convince of the theory of evolution in order to satisfy himself. So thorough and earnest a convert did Huxley become that his popular lectures and writings in defense of Darwin's theory have somewhat obscured his own original work in biology and zoölogy.

From 1854 to 1885 he was professor of natural history in the Royal School of Mines, London, being the first great teacher of biology by the laboratory method. Toward the end of his life he gave much time to public work in general education, to improving legislation concerning the fisheries, and the like, for he believed, in his own words, that he was "a man and a citizen before he was a philosopher."

Among Huxley's best-known writings are: 'Evidences as to Man's Place in Nature' (1863); 'Lay Sermons, Essays, and Reviews' (1872); 'The Crayfish: An Introduction to the Study of Zoölogy' (1880); 'Scientific Memoirs' (4 vols., 1898–1902).

HWANG RIVER. Winding through the mountains and over the fertile plains of northern China flows the great and terrible Hwang Ho ("Yellow River"), the "Sorrow of China." In its keeping are the lives and the fortunes of millions of people, and like a capricious giant it deals out death or wealth by turns. For thousands of years, since the earliest dawn of Chinese history, the people have struggled with this giant, trying to curb his strength, and today they are no nearer conquering it than ever.

Through the first two-thirds of its course the river, which is the second in size in China, flows through mountains, falling rapidly. The soil of these mountains is a yellow earth which dissolves easily and is washed down in enormous quantities by the river, staining its waters the deep yellow from which it, and the Yellow Sea, get their names. But as the river leaves the mountains and starts across the flat plains it begins to deposit this sediment. By degrees the bed rises and the people build embankments to prevent the river from overflowing. As the bed rises the embankments must be raised too, until the stream is flowing many feet above the level of the surrounding country. As time goes on the situation becomes more and more dangerous; finally a breach occurs and the whole river pours over the country, carrying destruction and ruin with it. If the breach cannot be repaired the river leaves its old channel entirely, and finds a new exit to the sea along the line of least resistance. Many times it has thus changed its course, entering the sea through different mouths as much as 500 miles apart.

In 1851 the river made such a change, and since then it has flowed to the north instead of to the south of the rocky peninsula of Shantung. It took 15 years to repair the damage, and even then many changes remained. The southern valley from a well-watered fertile plain was left practically without water. The northern valley was also injured because the river deposited three feet of sand and mud over the fields. Later the northern valley gained greatly in fertility because of the new water supply. In 1887 another flood occurred which swept away whole villages, killing more than a million people and flooding 50,000 square miles of territory.

The Hwang Ho rises in the mountains of Tibet, not far from the headwaters of the Yangtze Kiang. It makes first a great sweep to northward, and then, having struck a high mountain range, turns due south for 500 miles. It then turns eastward towards the sea. Although it is the second river in China, it is too shallow in winter, and too swift in summer, to be navigable. Its total length is about 2,700 miles.

HYACINTH. The ancient Greeks told this story of the origin of the beautiful and fragrant hyacinth. One day, said they, the god Apollo was playing a game of quoits with a young mortal, Hyacinthus, whom he dearly loved, when Zephyrus, the god of the west wind, passed by. Being jealous of Apollo the west wind blew the latter's quoit aside, and caused it to strike poor Hyacinthus, inflicting a mortal wound. In a few moments Hyacinthus died in Apollo's arms. In his memory the grieving Apollo then caused these beautiful clustered blossoms to spring from the fallen drops of the youth's blood.

A GARDEN BEAUTY



The hyacinth, a striking garden favorite, blooms in early spring. The many blossoms, clustered about a single spike, may be white, pink, blue, or scarlet.

At all events we know that the wild hyacinth was originally found in Greece and Asia Minor. It was by comparison an insignificant plant. Brought to western Europe in the 16th century, the hyacinth was extensively cultivated by Dutch horticulturists. They succeeded so well that the original blue and purple blossoms were varied to numerous shades of pink, rose, yellow, scarlet, and pure white, so that today we have a splendid selection from which to choose. The best bulbs are still grown in Holland, where gardening is a national industry.

The hyacinth proper belongs to the lily family. The water hyacinth (*Eichornia speciosa*), which occurs in American tropical and sub-tropical regions, is a

member of a different family *Pontederiaceae* It grows in such profus on and spreads so rapidly that many rivers in the southern United States are choked with it and water traffic is impeded Various methods of eradicating it have been tried Army engineers send out boats to cut out the jam of hyacinths as soon as it forms and the tangled mass is pushed into the current to be carried away Experiments are being made with a parasite which attacks the leaves from beneath and in time kills them Although it is almost without food value cattle are fond of it

The scientific name of the garden hyacinth is *Hyacinthus orientalis* The flowers are small bell-shaped tubes with 6 recurved segments borne in a crowded raceme on a stout scape stamens 6 in number The leaves are narrow erect from the base and 8 to 12 inches long The bulb produces long fibrous roots

HYDERABAD In the center of the peninsula of India lies Hyderabad a state about as large as Kansas Its population is largely Hindu Until 1948 when it was merged with India it was an independent princely state ruled by the Nizam—said to be the world's richest man The Nizam a Moslem became the state's rajpramukh (princely governor) Hindus replaced Moslems in the government

Hyderabad is on a plateau about 1 200 feet above sea level It is rich agriculturally and has great mineral wealth especially coal Agriculture is aided by irrigation including a huge tract which is watered by a dam two miles long across the Manjra River Railroads and manufactures are well developed Products include millet rice wheat oil-seeds cotton tobacco sugar cane wild silk (*tussur*) lac gums and oil

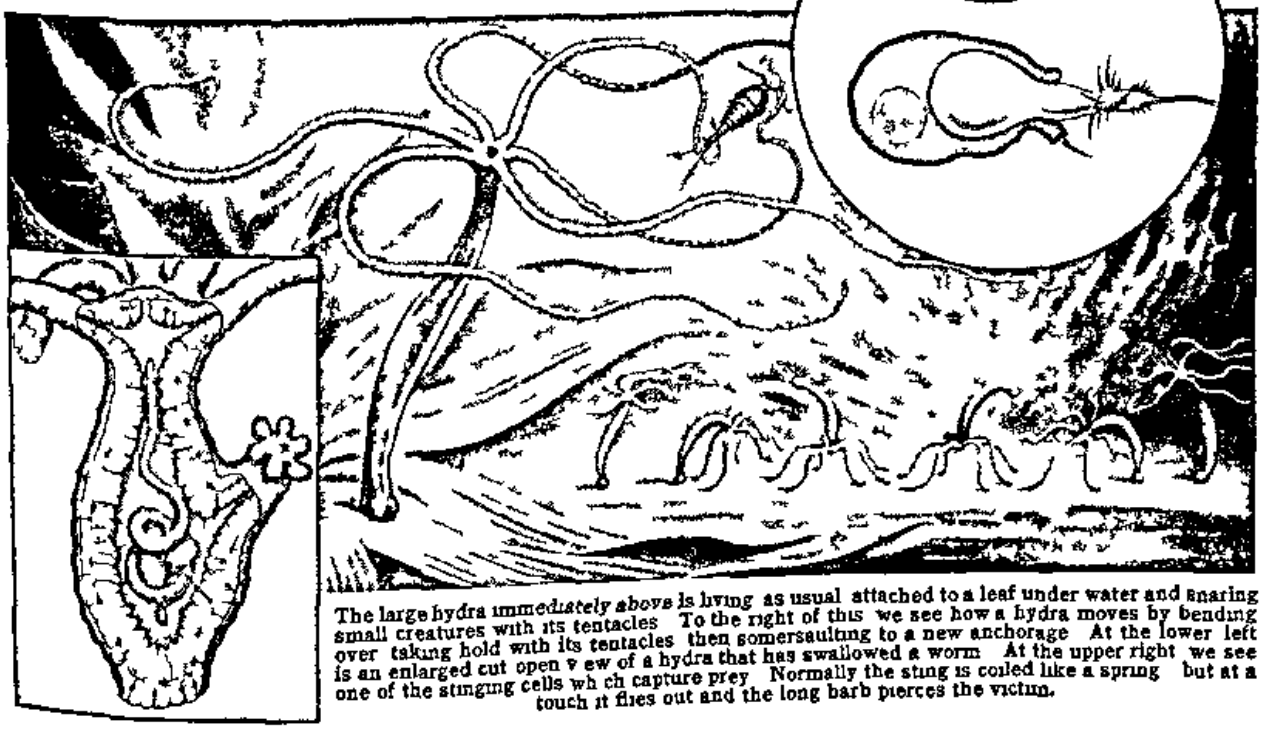
Fascinating relics of India's historic past abound in this region Chief among these are marvelous temples at Ellora and at Ajanta Most of these consist of caves cut from the solid rock and decorated with weirdly beautiful designs and figures made at the cost of enormous labor The Kailas at Ellora is looked upon as one of the wonders of the world The interior was carved out into great chambers and altars and bas reliefs On the outside the rockbound hill which formed its roof was chipped off and fashioned delicately into an exterior of graceful and intricate design Today the temple looks as if it had been built up stone by stone until a closer inspection shows that all the thousands of rich details are part of one great carved rock

The city of Hyderabad capital of the Nizam's state is the fourth largest city in India It has a population of 1 085 722 It must not be confused with a smaller city of the same name in Sind Pakistan

Hyderabad became independent during the 18th century when the Mogul Empire declined Its Nizam signed a treaty with the British in 1766 Hyderabad tried to keep its ties with Britain after the Indian Empire was dissolved (Aug 15 1947) It refused to join the new India In 1948 the Indian army moved in and after five days fighting the Nizam's forces surrendered Area 82 168 square miles population (1951 census) 18 655 108

HYDRA Gather in a jar some of the water plants and stones from a stagnant pond and empty them into a glass bowl filled with clean pond water Before long you will probably find attached to the glass where you can see them the tiny fresh water creatures called hydras They are named after the many headed

HOW THE HYDRA LIVES



The large hydra immediately above is living as usual attached to a leaf under water and snaring small creatures with its tentacles To the right of this we see how a hydra moves by bending over taking hold with its tentacles then somersaulting to a new anchorage At the lower left is an enlarged cut open view of a hydra that has swallowed a worm At the upper right we see one of the stinging cells which capture prey Normally the sting is coiled like a spring but at a touch it flies out and the long barb pierces the victim.

monster of Greek mythology (*see* Hercules). To the small animals on which they prey, these pond hydras are monsters too. Examine one with a magnifying glass. You will find it half as long as a common pin. The larger end is sticky, to attach it to objects in the quiet water of ponds and streams. The free end of the hydra is its mouth, capable of opening wide and surrounded by a circle of threadlike tentacles. Stinging cells in the tentacles poison and paralyze tiny crustaceans, worms, and other small creatures which touch them. Then the tentacles sweep the prey into the hydra's mouth.

The hydra is among the oldest and simplest of the many-celled animals (*see* Cell). It is closely related to the jellyfishes, sea anemones, and corals, which have bodies built on the same plan. The body structure is simple, but contains the essential elements of the more complex forms of animal life. It has two layers of cells—an outer layer for protection and an inner one to perform the digestive operations. The bases of the cells are drawn out into long muscle fibers; in the way these fibers act we see them as the forerunners of our own muscular system. A network of nerve cells extending throughout the animal transmits nervous impulses picked up by the sensory cells to the muscle cells, which contract, or to the gland cells, which secrete.

HOW BIG IS A HYDRA?



The size of a common hydra may be judged here by comparison with the finger, which points to the animal. The largest have bodies not quite an inch long.

Young hydras develop from buds on the sides of older ones, and also from eggs. If a hydra is injured, its lost parts are quickly restored, or "regenerated." If it is cut into pieces, each piece will soon form a complete hydra.

The few species of hydra, mostly world-wide but seldom abundant, are almost the only fresh-water representatives of their great branch of the animal kingdom (the *Coelenterata*). Two of the more common species of hydra are the brownish *Hydra fusca*, and the green *Hydra viridis*.

HYDRANGEA (*hī-drān'jē-ā*). One of our showiest flowering bushes is the hydrangea, with its huge globular masses of little flowers. These flowers are peculiar, because the ones we see on the outside of the clusters are not complete. They are sterile, without parts for bearing pollen or seed; but their showiness attracts pollen-bearing insects from afar, and the insects leave pollen in the small, fertile flowers inside the clusters.

The hydrangeas form a numerous group of about 35 known species. They are native in regions of mild to semi-tropical climate in North and South America, Japan, China, and the mountains of India. A few species are hardy enough to survive the winter in the northern United States, and these are favored as lawn shrubs. Other kinds, especially dwarf varieties, are grown, or at least started, as potted plants in greenhouses. They may be planted outdoors in summer. The flowers are usually pinkish or white; but in some species, a blue tinge can be imparted by adding iron or alum to the soil around the roots.

New plants are usually grown from suckers or cuttings of stems before the wood is fully ripe. Lawn shrubs should be sharply pruned in the fall or spring to force the next growth into flowers instead of stems. All hydrangeas require a rich soil or a supply of manure, ample water, and plenty of sun.

The name hydrangea comes from the Greek *hydor*, "water," and *angeion*, "pail." It refers to the shape of the seed pod. Hydrangeas belong to the saxifrage family. Scientific name of panicle hydrangea, *Hydrangea paniculata;* of snowhill hydrangea, *Hydrangea arborescens grandiflora;* of common dwarf plant, *Hydrangea macrophylla otaksa.*

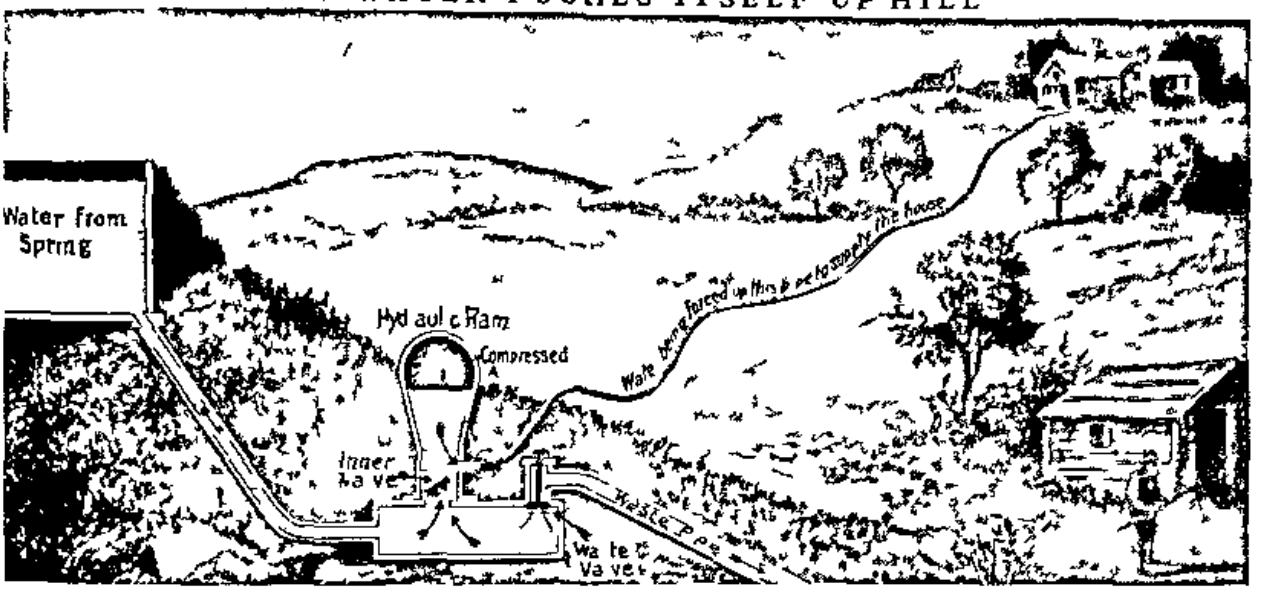
HYDRAULIC MACHINERY. Click-*chug!* Click-*chug!* Click-*chug!* In the green stillness of the wilderness the staccato beat of unseen machinery is a strangely foreign sound. Presently we come upon the source—a little hydraulic ram less than two feet high industriously pumping water to some unseen cottage on the heights above.

Let us see how it works. From a spring basin some 12 feet above the ram, an iron supply pipe brings the water to the ram at our feet. At first the water flows out through a waste valve and is carried off; but presently the increasing force of the water pushing up against the valve closes it, and it clicks shut. The column of water is instantly arrested, just as when we close a faucet. The recoil hurls the water against an inner valve, opens it, and as the water rushes in, the air in the rounded chamber above is compressed. With the recoil of the water the pressure on the waste valve is lessened, the valve drops open, again providing an outlet for the water, which now turns in that direction. The compressed air cushion in the air chamber expands, closing the valve to the supply pipe, and forcing a small amount of water into the delivery pipe, which leads up to the house on the hill. But as soon as the downward rush of water is resumed, it closes the waste valve again, and brings on another hammer-like blow at the air chamber valve. As the process is repeated, over and over, the water is pumped steadily to a height much greater than its source, with no other force than the energy developed by the fall of the water itself. With a plentiful flow of water and a fall of from 1½ to 10 feet, a water supply can be lifted as much as 250 feet by means of the ram mechanism.

The recoil of the water can also be made to drive the sliding piston of a pump attached to the body of the ram, the piston lifting and pumping water through ordinary pump valves. With this arrangement a ram working with muddy water may be used to raise clear spring water.

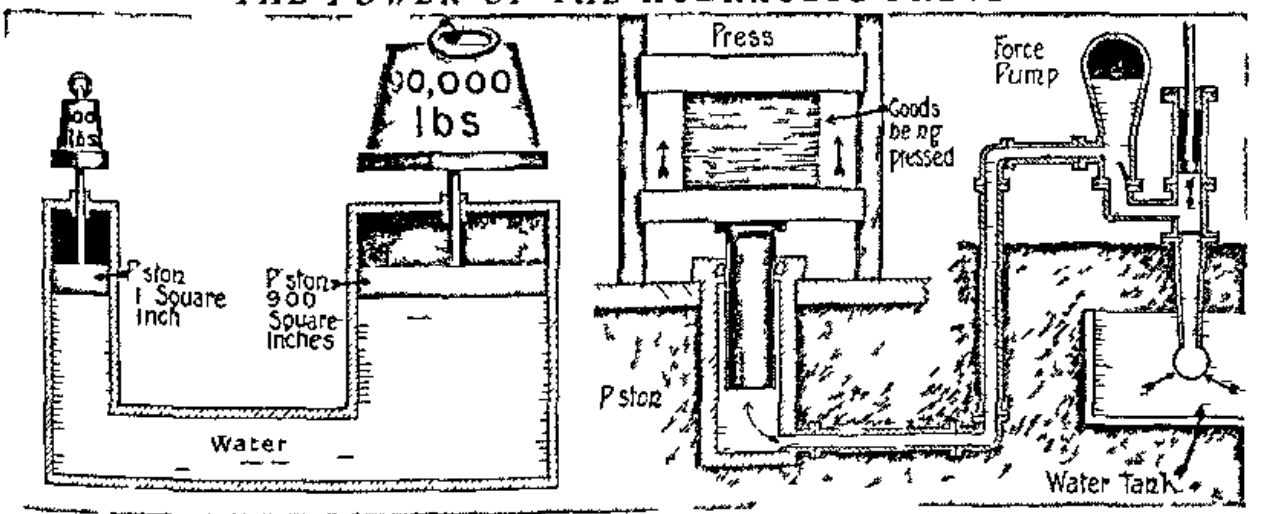
The hydraulic ram is only one of many machines operated with water power. These machines are possible because liquids are, for all practical pur-

HOW WATER PUSHES ITSELF UP HILL

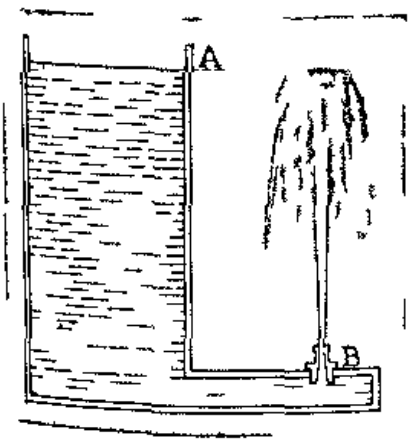


Here you see how a hydraulic ram forces water to run up hill From the spring reservoir the current first passes down through the lower part of the ram and out the waste pipe until it gains sufficient speed to close the waste valve This checks its course suddenly and its momentum carries it up through the inner valve gently compressing the air in the air chamber Once the water loses its momentum the compressed air forces it back but this closes the inner valve and so the water has to go up the supply pipe At the same time the rush of pressure being removed the waste valve opens again and the whole process repeats itself over and over

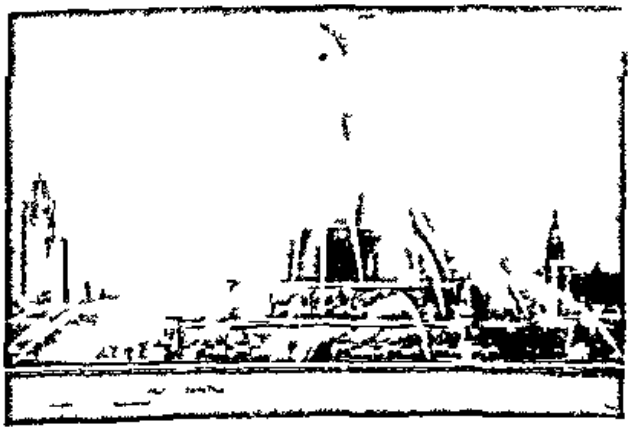
THE POWER OF THE HYDRAULIC PRESS



Here we see how a hydraulic press gets its *enormous power* The small piston has a surface equal to one square inch It pushes on the water before it with a pressure of 100 pounds to the square inch When this pressure is carried over to the larger piston with a surface of 900 square inches you naturally get a total pressure there of 90 000 pounds The picture at the right shows how this principle is used in an actual press



Hydraulic pressure may make the water *play in lovely* fountains like the Buckingham Memorial, Chicago shown at right The diagram at left shows the principle Water confined in a tank reaches the level A It is allowed to run out in a pipe at *the* bottom with an outlet B where pressure from the tank makes it jet outward



poses, not compressible, and pressure exerted on any part of liquid in a closed vessel will be transmitted equally to all parts of the liquid. This principle was discovered by Pascal, the great French thinker who lived in the 17th century.

One of these machines, the hydraulic press, is so powerful that a man, working an ordinary pump handle, can lift hundreds of tons of weight with it. It seems that this would be possible only with very complicated machinery, but as a matter of fact the hydraulic press is very simply constructed. We have a tank containing two pistons, one much smaller than the other. If the smaller piston is one inch square, and the other 30 inches square, and we exert a pressure on the smaller piston of 100 pounds, the larger piston will hold up a weight of 100 pounds to each square inch of its surface—30 x 30 x 100, or 90,000 pounds. If the small piston is a pump that lets in more water with each upstroke, the large piston is slowly but surely raised, exerting its enormous pressure.

Uses of the Hydraulic Press

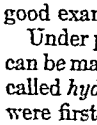
Before more rapid machinery was invented the hydraulic press was generally used for pressing oil from cottonseeds, for punching holes in steel plates, and for pressure in baling hay, paper, or cotton. Lead and tin pipes are sometimes made with the hydraulic press. These metals become plastic under tremendous pressure and flow out of the prepared orifices in the same way that macaroni is forced from the machine in which it is made by moderate pressure on the dough.

In hydraulic engines water under pressure pushes back the piston head until a sliding valve is opened by which it flows out. These engines are slow, and have been largely replaced by electric motors, although they are still occasionally used for hydraulic drive elevators or for pumping air for pipe organs. Turbines and water wheels are other forms of powerful machinery operated by water power, and used for many purposes (*see* Turbine).

"Hydraulics" (from the Greek *hydor*, "water" and *aulos*, "pipe") is the name which we give to the science which treats of the flow of water or other liquids in motion. The designing of dams, aqueducts, canals, and pipe lines is an important application of this science (*see* Water; Water Power; Water Supply).

HYDROCARBONS. Almost the entire bulk of living substances consists of only four chemical elements—carbon, hydrogen, oxygen, and nitrogen. Many substances contain only carbon and hydrogen. These compounds are called *hydrocarbons.*

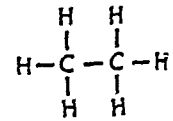
Hydrocarbons have as their core a chain or group of carbon atoms. To form the core, each carbon atom forms four bonds or links with other atoms. The simplest example of all is found in *methane,* or marsh gas. In methane, one carbon atom exerts a combining power (valence) of four to hold four hydrogen atoms, as shown at the right.



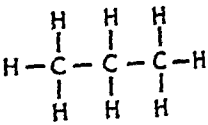
Methane

In other hydrocarbons, each carbon atom forms bonds with one or more other carbon atoms. The simplest example is the gas *ethane,* which has two carbon atoms. The link between these atoms uses one bond from each and leaves three free on each one to hold hydrogen atoms, as pictured below.

The ethane molecule shows a family resemblance to methane. If one hydrogen atom is taken from each of two methane molecules, the vacated links can bind the two carbon atoms together forming ethane. The group CH_3—formed from methane is called *methyl.* The dash in this formula represents the vacated bond.



Ethane



Propane

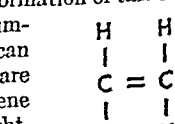
Methyl does not exist by itself in nature. It is a combining group, or *radical,* found only in compounds. Ethane enters into compounds as a similar radical (C_2H_5—) called *ethyl.*

Open-Chain Hydrocarbons

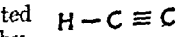
If methyl and ethyl radicals are joined end to end, they form a hydrocarbon called *propane* (C_3H_8) with three carbon atoms. Still more carbon atoms can be linked on, extending the carbon chain. Hydrocarbons of this kind may have as many as 70 carbon atoms. From the way the carbon chain can be extended, these compounds are often called "open-chain" hydrocarbons.

Each of these hydrocarbons has the maximum number of hydrogen atoms that can be held by the carbon atoms present. Hence these hydrocarbons are often called *saturated.* As saturated compounds, they are relatively inert. Therefore chemists frequently call them *paraffin* hydrocarbons, from the Latin terms *parum affinis,* meaning "slight affinity." Natural gas and petroleum consist largely of this type of hydrocarbon (*see* Petroleum).

In other kinds of hydrocarbons, adjoining carbon atoms will use two or even three of their bonds to form a link with each other. Formation of this double or triple bond cuts down the number of hydrogen atoms which can be held. Two simple examples are ethylene (C_2H_4) and acetylene (C_2H_2), pictured at the right. Compounds of this type are called *unsaturated.*



Ethylene



Acetylene

Open-chain hydrocarbons of either saturated or unsaturated type are often called *aliphatic* hydrocarbons. The name is from a Greek term meaning "oil" or "fat." It is given them because open-chain hydrocarbons are important constituents of oils and fats. Petroleum products are good examples of such compounds.

Under proper conditions, unsaturated hydrocarbons can be made to take up more hydrogen. This change is called *hydrogenation.* Processes which accomplish this were first applied to animal and vegetable oils to reduce their disagreeable odors or to harden them. The changes are chemical, new compounds being formed

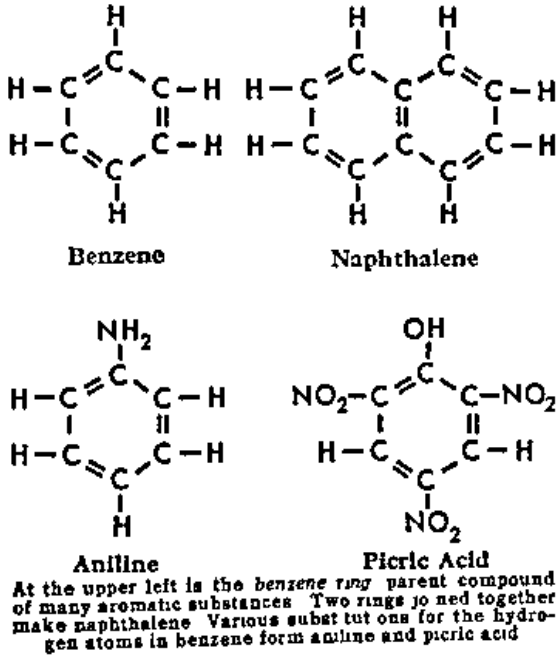
(*see* Oleomargarine) Such oils are used in making soap and candles Cottonseed oil so treated is edible. Hydrogenation is also used to increase the yield of gasoline from crude oil to produce oil and gasoline from coal, and in other processes

Benzene (Aromatic) Hydrocarbons

An extremely important class of hydrocarbons is the *closed-chain-cyclic*, or *aromatic* series It has as its fundamental unit the "benzene ring ' C_6H_6 so called because of the shape of its structural formula All the compounds of this series are *unsaturated*

The accompanying structural diagrams indicate some of the almost countless compounds which the synthetic chemist makes by replacing one or more of the hydrogen atoms around the benzene ring with other atoms or combinations of atoms To make aniline, the parent of numerous dyes, only a single substitution is necessary Phenol or carbolic acid has OH in place of one H of benzene In making naphthalene, another whole ring is added to the chain For the explosive picric acid, three hydrogen atoms are replaced with NO_2 and one with OH (*See also* Coal-Tar Products)

BENZENE AND SOME DERIVATIVES



Benzene — Naphthalene — Aniline — Picric Acid

At the upper left is the *benzene ring* parent compound of many aromatic substances Two rings joined together make naphthalene Various substitutions for the hydrogen atoms in benzene form aniline and picric acid

HYDROCHLORIC ACID One of the most important acids in scientific work and in industry is this colorless compound of hydrogen and chlorine (HCl) It is manufactured by treating common salt (NaCl) with sulphuric acid (H_2SO_4) yielding sodium sulphate as a by product, also by burning chlorine gas inside containers filled with hydrogen The pure product is a gas (hydrogen chloride), which develops acid properties only when dissolved in water A cubic foot of water will absorb 455 cubic feet of the gas

Gastric juice contains normally 0 2 per cent of hydrochloric acid It helps to dissolve the minerals in our food and acts in part as an antiseptic Hydrochloric acid unites with most metals and metallic oxides to form salts known as chlorides (*see* Chlorine)

HYDROGEN Most Americans know that the expression 'H 2-O" means "water " It is a chemical symbol which means that a molecule of water consists of two atoms of hydrogen (chemical symbol H) joined to one of oxygen (O) Chemists write it as H_2O Hydrogen owes its name to its part in forming water It was coined from the Greek terms *hydros* for "water" and *genos* for "parent" or ' born from "

In its pure state, hydrogen is a gas without taste, color, or odor It is one of the commonest of all the chemical elements Hydrogen is found from a considerable depth in the earth to the uppermost limits of the atmosphere The spectroscope shows that it is abundant in the sun and the stars It enters into hundreds of thousands of compounds, and is one of the four most abundant elements in all living tissue (*see* Hydrocarbons)

Hydrogen is the lightest of all elements When it is free in the air, it tends to escape to the upper atmosphere This tendency makes it the most buoyant gas for balloons But it is inflammable and so the slightly heavier gas helium is preferred (*see* Helium)

Hydrogen can be made to give one of the hottest flames known about 5 000°F One way this heat is applied is by means of the oxyhydrogen blowpipe In this jets of hydrogen and oxygen from different tanks are mixed in the proportion of two to one As they flow from the blowpipe tip they burn with a flame so hot that it can cut metal almost as easily as a knife cuts cardboard

Hydrogen can be obtained by passing steam over coke or coal This yields hydrogen mixed with carbon monoxide or dioxide, which can be removed If natural gas is passed over brick heated to a temperature of about 2 200°F it decomposes into carbon black and hydrogen Hydrogen can also be obtained by electrolysis (*see* Electrolysis)

Varieties of Hydrogen Atoms

Many facts about hydrogen can be explained from the electrical nature of its atoms (*see* Atoms) As its nucleus it has one particle (called a *proton*) of positive electric charge With this is one particle (an *electron*) of negative charge Two is the smallest number of particles that can form an atom and for this reason hydrogen is the lightest element

This simple atom of two particles is the commonest type, or *isotope*, of hydrogen Chemists call it *protium* Two other isotopes have been found In 1931 Harold C Urey obtained double-weight hydrogen by electrolysis of sodium hydroxide solutions This hydrogen with a mass number of 2 has one neutron as well as a proton in its nucleus It is called *deuterium* from the Greek for 'double " ' Heavy water " denser than ordinary water, can be prepared by burning deuterium Triple-weight hydrogen (*tritium*) was obtained by Ernest Rutherford in 1934 It has two neutrons and one proton in its nucleus It is produced naturally by cosmic rays which bombard and split nitrogen atoms in the upper atmosphere It can be prepared artificially by bombarding lithium with neutrons in an atomic reactor Both deuterium and tritium would probably enter into the manufacture of hydrogen bombs (*see* Atoms)

Two varieties of hydrogen called *ortho-* and *para-hydrogen* were demonstrated by K F Bonhoeffer of

Germany in 1929. They were unlike in heat conductivity, solubility, and other properties. This is explained by the theory of a spinning proton nucleus. In ortho-hydrogen both nuclei of the molecule (H_2) are spinning in the same direction, while in para-hydrogen the two spin in opposite directions.

Hydrogen Ion Concentration

In the normal atom, the opposite charges on the proton and the electron offset each other, and the atom is electrically neutral. But the hydrogen atom can lose its electron and exert the + charge on the proton. In this state, the atom is called a *hydrogen ion* (*see* Ions and Ionization).

Hydrogen ions are important in many chemical reactions, but particularly those of acids. Chemists have adopted the practise of measuring acidity (or its opposite, alkalinity) by the *concentration* of hydrogen ions in a substance. For their basis of measurement, they use water.

Even the purest water is partially ionized and contains some free H+ and OH− ions in addition to its H_2O molecules. Each liter of pure water has one ten-millionth of a gram of H+ ions and an equivalent amount of OH− ions. Addition of an acid to the water increases the proportion of H+; addition of a base decreases this proportion. To avoid such terms as ten-millionths, the logarithm of ten million, which is 7 (*see* Powers and Roots), is used as a base number with the symbol pH, that is, the hydrogen ion concentration of pure water is expressed as pH 7. This is the neutral point. Higher values indicate alkalinity and lower values acidity. Thus a solution of pH 8 has ten times greater concentration of OH ions relative to H ions than has a solution of pH 7.

What Hydrolysis Means

In many chemical reactions, the count of atoms in the end products amounts to those present at the beginning, plus addition of atoms corresponding to molecules of water (H_2O). Often the water equivalent appears separated into H and OH parts in different end products. Such a change is called *hydrolysis*.

The chemical symbol of hydrogen is H. It has been liquefied at −423°F. and frozen at −434°F. The atomic *weight* of hydrogen is 1.008, and the atomic *number* is 1 (*see* Chemistry). (For the actual weight, *see* Atoms.)

HYDROM'ETER. A floating body sinks deeper in a light than in a heavy liquid. This principle is applied in the hydrometer (from Greek words meaning "water measurer"), an instrument for determining the specific gravity, or density, of liquids. It is usually a glass tube, weighted at one end to keep it upright, and marked with a scale. This scale may directly indicate specific gravity, or it may consist of arbitrary degrees, as in the Baumé scales. Common uses of hydrometers are to test solutions in storage batteries and automobile radiators, and to determine the richness of milk.

HYENA (*hī-ē'nâ*). This unpleasant animal, about the size of a large dog, is noted for its cowardice and the unearthly shrieks, like the laughter of a maniac, which it utters when excited. It lives in caves and holes in Africa and southern Asia, sleeping by day and coming out at night to feed on carrion and start its unearthly howling. The hyena performs a valuable service to the health of the communities which it infests by devouring dead animals and thus acting as a scavenger. It does not dare to attack an animal that is standing still; but it often so terrifies horses and cattle that they run till they fall from exhaustion. Then the hyena tears its victims to pieces. It was formerly much dreaded in South Africa, where it often entered Kaffir dwellings at night and carried off children sleeping beside their mothers.

These carnivorous mammals are related in structure to the cats and the civets. They are ungainly creatures with large heads, and their forelegs are longer than the hindlegs which gives them an awkward shambling gait. Their powerful teeth and jaws are capable of crushing the hardest bones.

Hyenas (family *Hyaenidae*) have four toes on each foot, long forelegs, and nonretractile claws. The chief varieties are: *Hyaena striata*, striped hyena, found in India, Iran, Asia Minor, and north and east Africa; *Hyaena crocuta*, spotted hyena, South Africa.

A QUARREL OVER SPOILS IN THE DESERT



These are striped hyenas, feasting on the carcass of some creature killed by a lion, perhaps, and left half-eaten. Two jackals snarl at the hyenas for a share in the meal.

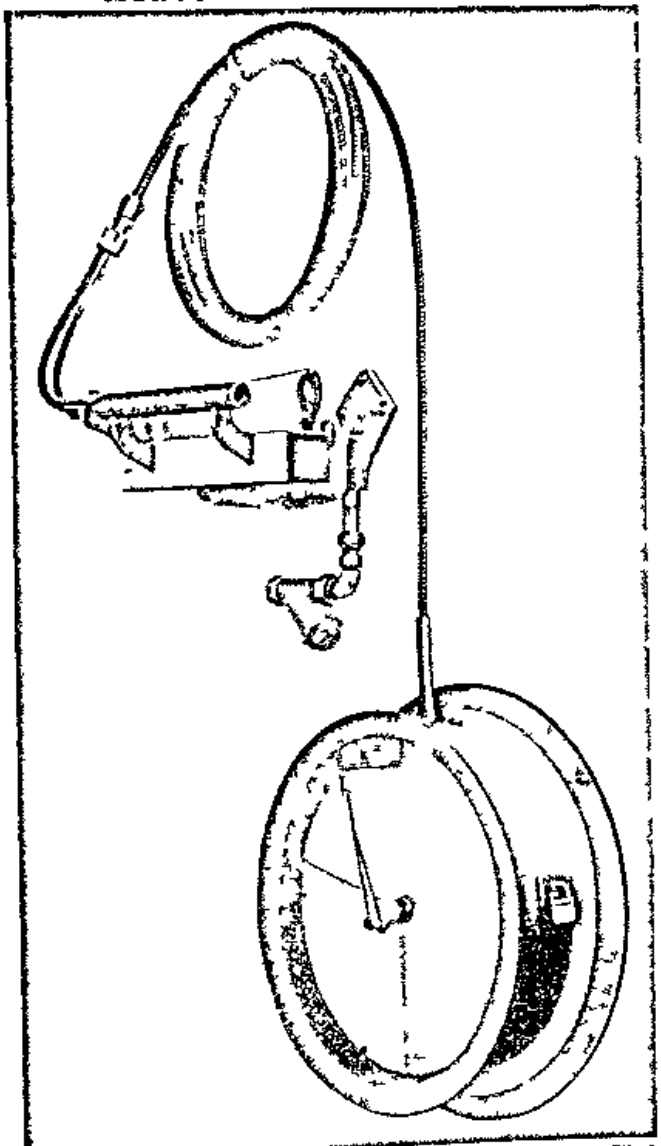
HYGROMETER One of the important factors which the Weather Bureau must take into account in making its forecasts is the humidity — the amount of moisture in the atmosphere To measure this various instruments are used, called 'hygrometers" One of the simplest is the toy known as the 'weather house," at the door of which a man appears if the weather is about to be wet, and a woman if it is to be fine It is operated by catgut threads, which grow shorter as the humidity increases and lengthen as it decreases, thus moving the figures Hair also contracts when moist, and is used in the hair hygrometer, moving a needle on a scale as it changes in length

The wet and dry bulb hygrometer, also called the "psychrometer," is the most generally used In the 'sling psychrometer" type two thermometers are fastened side by side on a stand, exactly alike except that the bulb of one is covered with wet muslin The thermometers are then whirled or fanned and the evaporation of the moisture in the muslin causes a fall in temperature in the wet-bulb thermometer — rapid if the day is dry, and slight if it is damp The dry thermometer records the actual temperature of the air and by comparing the two readings the humidity can be determined from a set of prepared tables

Another type is the dew point or condensing hygrometer This makes use of ether, which evaporates very quickly and soon cools one of the thermometers down to the point at which the moisture in the air begins to condense as dew From the dew point and the temperature of the air as given by the other thermometer, the relative humidity can be determined In chemical hygrometers the moisture in a given volume of air is absorbed by some such substance as calcium chloride or sulphuric acid and the increase in weight gives the amount of moisture

Hygrometers are used in many modern schools and office buildings to measure humidity so that moisture can be thrown into the air when the air becomes too dry (*see* Heating and Ventilating) They are also used in industries in which humidity is a factor such as the manufacture of textiles cigars, and paper

MEASURING AIR MOISTURE



In this type of hygrometer, the 'bulbs' are closed tubes filled with a volatile liquid and mounted on a frame with the dry bulb in front, just beneath the coiled tubing at the top A cloth covers the wet bulb and is kept uniformly moist by the water in the tank into which it dips The tubing connects the bulbs with hollow metal coils in the circular metal case and when changes in temperature cause the vapor in the tubes to change in volume these coils expand or contract This movement shifts the needles over the face of the card which is kept slowly turning by clockwork The combined movements trace a temperature record for each bulb By referring the differences in temperature to special tables, the humidity at any time can be determined

HYPNOTISM Many strange occurrences which were once looked on as miracle, magic, or delusion have been explained by modern science as results of that little understood condition known as hypnosis or hypnotism This condition resembles normal sleep except that the hypnotized subject may retain some of his powers to act such as the power to walk and talk, and the ability to understand what is said to him At the command of the operator the patient may lose all feeling in a leg or an arm so that a pin can be thrust in without pain The heart beat can be made slower or faster a rise in temperature and perspiration can be induced and there are records of cases where drops of blood were made to ooze through the skin

The hypnotized person will obey ridiculous orders and carry out feats of skill and strength impossible to him under normal conditions He will "see" people who are not there and if told that a person, who may actually be directly in front of him, has departed, he will believe it, and may even try to walk over the spot where that person is standing

In light hypnosis a person may remember the facts of his normal life and may recall when he "wakes up" what he said and did while hypnotized, but deep

hypnosis produces a complete loss of memory in both respects, unless the operator orders the patient to remember something. Perhaps the most useful feature of hypnotism is found in what are called "post-hypnotic suggestions." These are suggestions made to the patient while hypnotized which he will carry out afterward. For instance, if the operator tells him that, when he awakens, he must take off his coat as soon as someone coughs four times, the patient will do so, without being conscious of the reason for the action. It is this effect of hypnotism which is used by certain medical specialists in breaking drug habits and other forms of nervous diseases.

How the Hypnotist Controls His Subject

To understand even the simplest facts of hypnotism one must realize that the brain functions in such a way that we are aware of some of our activities and not of others. When we are asleep we are not aware of our surroundings. When we act "absent-mindedly" our brain is controlling certain acts without our attention being called to this fact. Moreover, the brain is sensitized to certain stimuli more than to others. The fireman sleeps through any amount of ordinary noise but springs up at the faintest tinkle of the fire alarm.

A similar condition is produced in hypnosis. The subject is given suggestions by the hypnotist which make him quite unresponsive to the ordinary forms of stimulation. He is not in a true sleep but he acts as though he were asleep. The hypnotist has told him to sleep but also to listen and be ready to respond to commands or suggestions.

Like the fireman, the hypnotized person is sensitized and will respond to certain stimuli; in this case those brought to him through the voice of the hypnotist. The suggestion that he is asleep and the fact that he has previously agreed to co-operate with the hypnotist make the subject less critical than he would be if normally awake. The hypnotist tells him that he cannot open his eyes, that he may try, but that he will not succeed. He feels that what the hypnotist has said is true. He tries but fails. In a similar fashion he follows other suggestions. He follows suggestions, that is, unless they are such as to make him do something which conflicts violently with his moral sense. He would not, for example, be likely to take off all his clothes in public. A suggestion like this would cause the individual to reassert himself and the hypnotist's power would be at an end. People have been made to commit fake crimes under hypnosis, but there is every reason to suppose either that they had latent criminal tendencies which came to expression during hypnosis or that they were aware all along that their act would not constitute an actual crime.

The methods used to produce hypnosis are usually simple. The patient is asked to fix his eyes on some bright object and to let his "mind become blank" as far as possible. The hypnotist says some soothing words, speaking in a monotone, and perhaps at the same time stroking the patient's head or passing his hands before the patient's eyes. It is suggested that the patient will go to sleep, that his eyes are getting tired, that his eyelids are getting heavy, that his muscles are relaxing, and that he will soon be fast asleep yet ready to follow the suggestions of the hypnotist. Sometimes, within a few minutes, the eyelids will tremble and then gradually close. Then the suggestion that the eyes cannot be opened will be used to test the degree of control that the hypnotist has attained over his patient. The subject is usually wakened at the command of the hypnotist. Without the command, however, he would waken of his own accord or go into a normal sleep from which he would waken normally.

In order to produce hypnosis, the hypnotist must have what is commonly called "prestige." The more firmly the patient believes in the power of the hypnotist, the more readily he will give way to hypnotic suggestion. Thus it is especially difficult to hypnotize one's best friend. In any event, hypnosis should be left to the medical man or to the clinical psychologist. When used by untrained persons it may have undesirable aftereffects and may even be dangerous.

Leaders such as Hitler are credited with having produced a sort of group, or mass, hypnosis. It is commonly said that fakirs who do "impossible" tricks have hypnotized their audience. Scientists reject the notion that masses may be hypnotized against their will, but they admit that crowd situations, especially involving a leader of great power, can produce a heightened degree of suggestibility similar to that involved in hypnosis.

Mesmer and Mesmerism

When hypnosis first claimed the attention of scientists, it was called "animal magnetism" or "mesmerism," after Dr. F. A. Mesmer of Vienna. In the late 18th century, Dr. Mesmer used it to heal certain nervous ailments. He thought some sort of magnetism, animal rather than material in nature, went from him into his patients. For many years mesmerism was a great mystery and generally associated with stage performances, fraud, and superstition.

Medical men at first denounced it and Mesmer's claims. They began to use it in surgery, however, before the discovery of anesthetics. Surgeons found that a deeply hypnotized patient will lie perfectly still and without pain during operations, even those as serious as an amputation. A doctor named James Braid about 1840 coined the term "hypnosis," which means a "nervous sleep." The new name was more acceptable than mesmerism, with its implications of fraud, and it soon supplanted the older term.

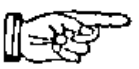
Hypnosis now has a firm basis in science. Psychologists use it in their laboratories to study human behavior and mental diseases. Psychiatrists and clinical psychologists often use it in the treatment of nervous disorders. It is sometimes combined with psychoanalysis under the name "hypnoanalysis." Some doctors and dentists still use hypnosis as an anesthetic in cases where, because of heart or other adverse physical conditions, the more convenient anesthetics cannot be used.

THE EASY REFERENCE FACT-INDEX

GUIDE TO ALL VOLUMES FOR SUBJECTS BEGINNING WITH

G-H

TO SAVE TIME

USE THIS INDEX 

EDITOR'S NOTE ON NEXT PAGE TELLS WHY

SPECIAL LISTS AND TABLES

TEMPERATURES FOR CHANGES OF STATE IN GASES	470
FACTS ABOUT THE GREAT LAKES	495
RULERS OF THE HOLY ROMAN EMPIRE	533

Numerous other lists and tables in the fields of geography, history, literature science mathematics and other departments of knowledge will be found with their appropriate articles in the main text

THE PLAN ARRANGEMENT AND CONTENTS OF THIS INDEX ARE ORIGINAL WITH F. E. COMPTON & COMPANY AND ARE FULLY PROTECTED BY UNITED STATES IMPERIAL AND INTERNATIONAL COPYRIGHT AND REGISTERED TRADE MARK NO. 336,781

EDITOR'S NOTE

EVERY user of Compton's Pictured Encyclopedia should form the habit of *first* turning to the Fact-Index section at the end of each volume when in search of specific information. This index is a miniature work of reference in itself and will often give you directly the facts, dates, or definitions you seek Even when you want full treatment of a subject, you will usually save time by finding in the index the exact page numbers for the desired material.

All page numbers are preceded by a letter of the alphabet, as A-23. The letter indicates the volume. If two or three page numbers are given for the topic you are seeking, the first indicates the more general and important treatment; the second and third point to additional information on other pages. Where necessary, subheadings follow the entry and tell you by guide words or phrases where the various aspects of the subject are treated.

The arrangement of subheadings is alphabetical, except in major historical entries. In these the chronological order is followed.

The pictures illustrating a specific subject are indicated by the word *picture* or *color picture* followed by a volume indicator and a page number. A picture reference is frequently intended to call attention to details in the text under the illustration as well as to the illustration itself. This picture-text, therefore, should always be carefully read. The pictures are usually on the same page as the text to which you are also referred; sometimes they are found in a different but related article which will add interest and information.

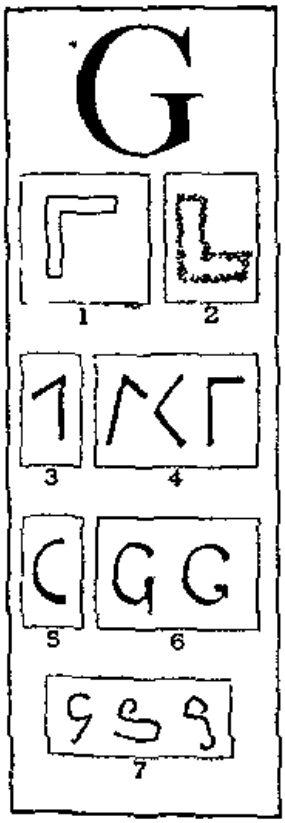
The pronunciations given are those preferred by the best and most recent authorities; alternative pronunciations are indicated where usage is divided.

In recent years hundreds of foreign geographical names have been changed, either officially or by custom. Both old and new names are given at the appropriate places in the alphabet.

Populations are those of the latest census or an official estimate when available if no census has been taken since World War II. Distances between points are map or air distances, not distances by railroad.

THE EASY REFERENCE FACT-INDEX

Reg U S Pat Off



OUR LETTER G probably started in ancient Egypt as a sign for an angle in a wall (1) Shortly after 2000 B C a Semitic people called the Semites adopted it as an alphabetic sign for the hard sound of g (as in gay) because to them the sign looked like a carpenter s square and their name *gimel* for 'a square began with this sound

These people used a crudely made square (2) for the letter The later Canaanite Phoenician writing gave the sign a simple form (3) suited to writing in Semitic fashion from right to left In Hebrew the sign was called *gimel* and other Semitic languages had similar names In all these alphabets the letter had the third place after A and B

The Greeks took both the angular form and the pronunciation of the Phoenician letter into their writing but they changed the name to *gamma*, and gradually they gave the letter a more pleasing appearance (4)

When the Romans took over the Greek alphabet they gave the sign a rounded shape and turned the opening to the right (5) But for a time they used it for the same sound as k Thus they had two signs for one sound and none for the hard g To remedy this lack they gave the C sign a tail and this made a G (6) They also made it the seventh letter of the alphabet in the old place of the Greek Z which they were not using at this time

The capital letter came from Latin into English without change but after the Norman conquest of England the English adopted the French practice of pronouncing a soft g (as in gem) before e, i and y, in words of French, Latin and Greek origin (ginger gymnasium)

Our handwritten small g was developed from the capital by using a loop at the bottom for speedy writing (7) Our printed small g is a form of the hand written one

NOTE —For the story of how alphabetic writing began and developed *see* the articles Alphabet Writing

G 1 G 2 G 3 G-4 designations of U S Army general staff A 383

Gabae town in Persian Empire *See in Index* Isfahan

Gabardine (*găb ẽr-dēn'*) the gown or cloak which Jews were compelled to wear in the Middle Ages also a twilled cotton or worsted fabric having a raised cord on one side

Gabbro an igneous rock M 266 geological classification *See in Index* Rock *table*

Gabelle (*ga bel'*) in old English and European law a *tax excise im* post or duty in French history a salt tax abolished 1790 F 291

Gabers *See in Index* Ghebers

Gabii (*ga bi-i*) an ent city of Latium, 12 mi e of Rome captured by Tarquinius Superbus *excavations* have yielded notable works of art Artemis of Gabii *picture* E 443

Gabinius Aulus (died 47? B C) Roman politician as tribune 68 B C established Gabinian law which gave Pompey command in Mediterranean consul 58 B C proconsul in Syria 55 B C banished for extortion though defended by Cicero whom he had exiled while consul

Gable Clark (born 1901) motion picture actor born Cadiz Ohio won Academy award for performance in It Happened One Night (1934) officer in U S Army Air Forces in World War II (Mutiny on the Bounty Gone With the Wind Command Decision)

Gable in architecture A 319 *pictures* A 199 204 214 *See also in Index Architecture table* of terms

Gabon (*ga bōn'*) territory in s w French Equatorial Africa approximately 103 100 sq mi pop 423 904 cap Libreville *map* A 46

Gaboriau (*ga bō rĕ o'*) Émile (1832–73) French writer of detective stories (Monsieur Lecoq 'The Slaves of Paris Other People s Money')

Gabriel (*ga' brĭ ĕl*) archangel and heavenly messenger sent to the Virgin Mary (Luke I 19 26) the prophet Daniel and others recognized by Mohammedans as well as Christians and Jews commemorated as saint in Roman Catholic church March 24 character in Paradise Lost M 280

Gabrilowitsch (*găb-rĕl ō' vĭtch*) Ossip (1878 1936) pianist and conductor born St Petersburg (now Leningrad) Russia married Clara Clemens daughter of Mark Twain conductor Detroit Symphony Orchestra 1918–36

Gad in Bible son of Jacob ancestor of Israelite tribe of Gad also name of seer and chronicler of King David s reign

Ghadames or **Ghadames** (*ga da mes'*) town in Libya in an oasis of the Sahara about 300 mi s w of city of Tripoli pop *2768 maps A 187* A 46

Gaddi (*gad' dē*) family of Florentine artists of whom most important was the architect and painter **Taddeo** (1300?–1366) pupil of Giotto said to have continued Giotto s work on Florence campanile and to have planned the Ponte Vecchio

Gade (*ga' dĕ*) **Niels Wilhelm** (1817–90) leading Danish Romanticist composer his music is lyrical and highly polished wrote symphonies overtures suites and songs (Erl King's Daughter The Springtide Phantasy 'The Crusaders')

Gadfly *See in Index* Horsefly

Gadfly of Athens nickname of Socrates S 224

Gadolin (*gad' ō lin*) **Johan** (1760–1852) Finnish chemist discoverer *of yttrium*

Gadolinium a chemical element *tables* P 151 C 214

Gadsden Christopher (1724–1805) a leader in American Revolution born Charleston S C delegate to Continental Congress 1774 76 brigadier general Continental Army 1776–78 voted for ratification of U S Constitution 1788

Gadsden James (1788 1858) diplomat, grandson of Christopher Gadsden born Charleston S C as minister to Mexico negotiated Gadsden Purchase (1853)

Gadsden Ala manufacturing city on Coosa River 56 mi n e of Birmingham near Lookout Mt pop 55 725 coal and iron and timber region iron and steel cotton, tires *farm* machinery and lumber products A 116 *maps* A 126 U 253

Gadsden flag F 130c *color picture* F 128

Gadsden Purchase territory s of Gila River in Arizona and New Mexico bought by U S from Mexico in 1853 U 377–8 *map* U 379

Gad s Hill, home of Charles Dickens *D-85*

Gadwall or gray duck a surface feeding duck (*Anas strepera*) D 159

Gaea (*jē'a*), or Ge, in Greek mythology the ancient goddess "Mother Earth"; corresponding Roman goddesses were Tellus and Terra: U-405, R-132
intercedes for Daphne D-17
Gaelic (*gāl'ik*), ancient language of Ireland and Scotland I-227–8, I-234
college, Cape Breton Island C-118
Gaelic League, in Ireland I-230*a–b*, I-234
Gaels (*gālz*), ancient Celtic peoples of Ireland and Scotland, who spoke Gaelic language.
Gaeta (*gā-ā'ta*), Italy, strongly fortified seaport 45 mi n w. of Naples; refuge of Pope Pius IX when he fled (1848–50) from Rome; Francis II of Naples surrendered to Garibaldi here in 1861 after long siege
Gaff, a spar, *diagram* S-151, *picture* B-216. *See also in Index* Nautical terms, *table*
Gaff, in fishing, *list* F-118*h*
Gág (*gāg*), Wanda (1893–1946), artist and author, born New Ulm, Minn of Bohemian parents; writer and illustrator of children's books ('Millions of Cats', 'The A.B.C. Bunny'; 'Gone Is Gone'; 'Snippy and Snappy'; 'Growing Pains', story of how she grew up)
illustrations S-411, *pictures* G-217, S-404
Gage, Lyman J. (1836–1927), financier, born De Ruyter, N. Y.; secretary of treasury 1897–1902; president U. S. Trust Co, N. Y, 1902–6; a leader of Middle West banking interests; president board of directors, World's Columbian Exposition, Chicago
Gage, Thomas (1721–87), British general, governor of Massachusetts and military commander in chief in America at outbreak of American Revolution; entered army 1741; went to America, under General Braddock, 1754; with Braddock when he was defeated by Indians, 1755; superseded by Howe after Bunker Hill
Lexington and Concord L-178
Gage, measurement. *See in Index* Gauge
Gage plum P-322
Gag resolution, a rule adopted by Congress in 1836 which provided that all antislavery petitions submitted to Congress be disregarded C-331
John Quincy Adams opposes A-16
Gaheris (*gā'hēr-is*), Sir, knight of the Round Table R-236
Gahn (*gān*), Johan Gottlieb (1745–1818), Swedish chemist and mining engineer, first to isolate pure manganese.
Gaillard, Château. *See in Index* Château Gaillard
Gaillard (*gīl-yärd'*), David Du Bose (1859–1913), Army officer and engineer, born Sumter County, S.C.; after 1908 in charge of construction of Panama Canal between Gatun and Pedro Miguel.
Gaillard Cut (formerly known as the Culebra Cut), section of Panama Canal P-63, *pictures* P-53–4
Gaillardia (*gā-lär'di-a*), a genus of annual and perennial herbs of the composite family with showy yellow, orange, or red flower heads; native to w. North America; also called blanket flower
how to plant, *table* G-16
Gaines' Mill, battle of, in McClellan's campaign 1862, on Chickahominy River 9 mi. n.e. of Richmond, Va.; second of Seven Days' Battles.
Gainesville, Fla., winter resort 65 mi. s.w. of Jacksonville; pop. 26,861: *maps* F-158, U-253
University of Florida, *picture* F-150
Gainesville, Ga., city 48 mi. n.e. of Atlanta; pop. 11,936; poultry center; cotton, hosiery, thread mills, leather and furniture factories, Brenau College, for women; Riverside Military Academy: *map* G-76
Gainesville, Tex, city 62 mi. n.e. of Fort Worth, on Elm Fork of Trinity River; pop 11,246, oil fields, farming, livestock; Community Circus; Gainesville Junior College, Lake Texoma nearby: *map* T-90
Gainsborough (*gānz'bór-ō*), Thomas (1727–88), English painter G-1
'The Honorable Mrs. Graham', *picture* G-1
Gairdner, Lake, in s. South Australia, *maps* A-488, 478
Gaiseric. *See in Index* Genseric
Gaits, of horses H-428*h*, *pictures* H-428*f–g*
Galac'tose, a simple (monosaccharide) sugar ($C_6H_{12}O_6$), occurring in the brain and nerves; not found in nature and obtained by reduction of milk sugar (lactose)
Galahad (*gāl'a-hād*), hero of Arthurian legends G-1–3, *pictures* A-393–4, G-2
Galápagos (*gä-lä'pä-gōs*) Islands (official name Archipiélago de Colón), also called Tortoise Islands from Spanish *galápagos* ("tortoises"), group of islands belonging to Ecuador, 2868 sq. mi.; pop. 1346: G-3–5, E-230, S-276, *maps* G-3, W-204, *pictures* G-4
iguana I-25
lava field, *pictures* S-255, G-4
national park N-39
Galata (*gä'lä-tä*), seaport, and suburb of Istanbul, on Golden Horn, shipping and trading: *map* I-258
Galatea (*gāl-a-tē'a*), in mythology, statue made by the sculptor Pygmallon and endowed with life by Venus in answer to his prayer; also, nymph in various legends.
Galati (*gä-lä'tsē* or *gä-lats'*), or Galatz (*gä'lats*), Rumania, Danube port in the east; pop. 100,000: D-16, *maps* B-23, E-417
Galatia (*gā-lā'shi-a*), ancient country in central Asia Minor
Celts found kingdom C-163
Gala'tians, Epistle to the, 9th book of the New Testament, written by the Apostle Paul to the Galatian churches about A.D. 56.
Galatz, Rumania. *See in Index* Galati
Galaxy, in astronomy A-443, N-106–7, S-370–1, *picture* S-370
Milky Way. *See in Index* Milky Way
Galba (*gāl'ba*), Servius Sulpicius (5 B.C.–A.D. 69), Roman emperor for seven months
Nero overthrown by N-110
Galdhöpiggen, peak in s. Norway, highest in Scandinavia (8160 ft.), *map* N-301
Galdos, Bénito Pérez. *See in Index* Pérez Galdós
Gale, Henry Gordon (1874–1942), physicist and educator, born Aurora, Ill.; with University of Chicago from 1899 (dean of division of physical sciences 1931–40); author of 'Practical Physics'.
Gale, Zona (Mrs. William Llywelyn Breese) (1874–1938), writer, born Portage, Wis.; first wrote sentimental stories ('Loves of Pelleas and Etarre'; 'Friendship Village'); later, realistic novels depicting small-town life with fidelity and humor ('Birth'; 'Faint Perfume'; 'Preface to a Life'); won 1921 Pulitzer prize for dramatization of her novel, 'Miss Lulu Bett': A-230*f*
Gale, a strong wind S-403, W-155
Ga'len, Claudius (A.D. 130?–200?), Greek physician, celebrated ancient medical writer whose some 500 treatises (of which only about 80 now exist in print) were long accepted as authority: M-164*b*–65, *picture* I-202
theory of blood circulation B-210
Gale'na, Ill., city in extreme n.w. of state; formerly an important lead- and zinc-mining center, now trade and distributing point of a dairying region; many old and beautiful houses and public buildings; pop. 4648. *map* I-36
Grant's home G-152, *picture* I-42
origin of name L-141
settlement I-41
Galena, Kan., city in extreme s e. Kansas; named for deposits of galena ore in vicinity; pop 4029: *map* K-11
Galena (lead sulfide), a common ore of lead L-141, *table* M-176
used in early radio sets R-36
Gale'rius (Galerius Valerius Maximianus), Roman emperor 305–311; from common soldier became Diocletian's son-in-law and successor
Constantine and C-456
gives Christians freedom of worship C-302
Galesburg, Ill., manufacturing city 40 mi n.e of Burlington, Iowa; pop. 31,425; railroad shops; packed meats, bricks, farm machinery; Knox College: *maps* I-36, U-253
Galicia (*gā-lish'i-a*), Polish Galicja, former Austrian crownland, on n. slopes of Carpathians; now included in s e. Poland and in the w. Ukraine, Russia; area, more than 30,000 sq. mi.; petroleum and natural gas in e.; timber; grains, potatoes; livestock: *map* A-497
seized by Austria (1772) A-498
World War I W-221, 225–6
Galicia, Spain, district in n.w. corner, formerly kingdom
people S-314
Gal'ilee (Hebrew *border* or *ring*), Roman province in n. Palestine; land of Christ's boyhood and chief center of his active work: P-44, *map* B-138
Galilee, Sea of, or Gennes'aret, Sea of, also called Sea of Tiberias and Lake Kinneret, or Lake Chinnereth, large pear-shaped lake in n. Palestine traversed by Jordan River; 64 sq. mi.; frequented by Christ and disciples: *maps* P-45, B-138, I-256
Galileo (*gāl-i-lē'ō*, Italian *gä-lē-lē'ō*) (1564–1642), great Italian scientist G-5–6, *pictures* G-5, P-230–1
attempt to measure speed of light L-230
discovers law of falling bodies G-171, *pictures* G-171, P-230
mechanics, contributions to P-232
pendulum discovery P-118, *picture* A-155
telescope T-46, *pictures* T-47, P-231, I-203
thermometer T-117
Gall, or Gallus, Saint (died A.D. 640?), Irish monk and missionary to European continent; founded monastery of St. Gall, Switzerland.
Gall (Indian name *Pizi*) (1840–94), chief of Hunkpapa Sioux tribe; in 1868 refused to go to reservations, and in 1876 was chief leader in battle of Little Bighorn when Custer was killed; after 1889 judge of Court of Indian Offenses at Standing Rock Agency in South Dakota.
Gall, Franz Joseph (1758–1828), German anatomist and founder of phrenology P-227
Gall, a swelling on plants caused by parasites. *See in Index* Galls
Galla (*gāl'a*), one of an African Cushitic people A-39

Galland (*gȧ lȧ̇ŋ*) **Antoine** (1646–1717) French orientalist first European translator of Arabian Nights professor of Arabic at Collège de France Paris A 292

Gallas powerful and most numerous of Hamitic peoples of East Africa and Ethiopia E 402

Gallatin Albert (1761–1849) American economist and statesman born Geneva, Switzerland one of greatest of financiers U S representative 1795–1801 as secretary of treasury under Jefferson and Madison systematized government s finances led negotiations for *Treaty of Ghent (1815) minister* to France 1816–23 minister to England 1826 notable researches in life and history of American Indian founded American Ethnological Society of New York 1842 helped found New York University Treaty of Ghent, *picture* M 23

Gallatin River Mont flows n 170 mi from Yellowstone National Park, for 70 mi through picturesque canyon to Missouri River *maps* M 367 374 *picture* M 367

Gallaudet (*gȧl-ȧ dĕt*) **Thomas H** (1787–1851) educator born Philadelphia founder of first deaf mute institution in America D 25 statue by Daniel Chester French *picture* F 285

Gallaudet College (formerly Columbia Institution for the Deaf) at Washington D C founded 1857 by Congress to carry on education of deaf now includes Kendall School for children and a graduate department of education supported by the District of Columbia Congress endowments and tuition D 25
Daniel Chester French statue *picture* F 285

Gall bladder L 277 *color pictures* P 241 2, *diagram* D 91

Galle (*gȧl u*) **Johann Gottfried** (1812–1910) German astronomer discoverer of 3 comets first to observe the planet Neptune

Galle (*gal*) also **Point de Galle** (*pwăn dȧ gal*) a port of Ceylon on s w coast seized by Portuguese in 1518 fortified by Dutch in 1640 British since 1796 former center of spice trade pop 49 038 *maps* I 54 A 407

Gallegos (*gȧl yă gŏs*) inhabitants of the district of Galicia Spain resemble Portuguese

Galleon (*găl ĕ ŏn*) (derived from galley) a three or four decked sailing vessel of 15th to 17th century with lofty castles at bow and stern *picture* S 153
Spanish Armada A 373

Galleria Vittorio Emmanuele at Milan *Italy M 247*

Gallery woods G 168b

Galley in printing an oblong steel tray for type that has been set

Galley of boat *See in Index* Nautical terms *table*

Galley on airplane *picture* A 536

Galley ship propelled wholly or partly by oars
Greek and Roman N 91 *picture* S 195 *color picture* S 27
Middle Ages S 150
Phoenician S 149 50 *picture* S 153
Spanish Armada A 373

Galley slaves *picture* S 195

Gallfly O 320 I 150

Gall gnat also called **gall midge** fly of order *Diptera* family *Cecidomyiidae* or *Itonididae* which includes the Hessian fly

Gallia. *See in Index* Gaul

Gaillard (*gȧl yĕr l*) lively 16th century Italian dance in triple time popular especially in England *See also in Index* Pavane

Galli Curci (*gȧl lē kor chē*) **Amelita** (Mrs Homer Samuels) (born 1889) Italian American coloratura soprano born Milan Italy of Italian Spanish parentage studied piano in Royal Conservatory Milan and taught there was practically self taught in voice debut 1909 in Rome Italy as Gilda in Rigoletto sang with Chicago and Metropolitan opera companies sang publicly only a few times after a throat operation in 1936

Galliard (*gȧl yȧ ne*) **Joseph Simon** (1849–1916) French general and colonial administrator conqueror and pacificator of Madagascar (1896–1905) military governor of Paris (1914 15
first battle of Marne W 220 M 98

Galliformes (*gȧl ĭ for mez*) an order of fowllike ground dwelling birds including guans grouse quails pheasants turkeys and domestic chickens

Gallinule (*gȧl ĭ nul*) water bird resembling coot and rail in habits and like them called mud hen R 67

Gallio Lucius Junius Annaeus (1st century AD) Roman proconsul of Achaea (AD 53) who cared for none of these things when the Jews haled the Apostle Paul before him caress Gallio has become a synonym for an indifferent person older brother of Seneca

Gallipoli (*gȧ lĭ p ō lē*) Turkish **Gelibolu** (*gĕ lē bo lo*) port on Gallipoli Peninsula Turkey key to Dardanelles former Turkish naval station *first European possession* of Turks taken in 1353 *map* G 189

Gallipoli Peninsula (ancient Chersonesus) separating the Dardanelles on e from Gulf of Saros on w 50 mi long 4 to 13 mi wide seized by Ottoman Turks in 1353
World War I W 223 Churchill advocates attack C 305

Gallitzin Demetrius (1770–1840) Roman Catholic missionary born The Hague son of Russian prince came to America 1792 and ordained priest in Baltimore 1795 founded a colony at Loretto in s w Pennsylvania (1799) and labored there 41 years spending his fortune on the welfare of the settlement

Gallium chemical element *tables* P 151 C 214

Gällivare (*yĕl ĭ va rĕ*) Sweden village n of Arctic Circle pop 3222 iron mines S 462 *maps* E 416–17, N 301

Gall midge *See in Index* Gall gnat

Gall mites S 347

Gall nut. *See in Index* Galls

Gallon a unit of measure *table W 87*

Galloway Joseph (1731 1803) lawyer born West River Md tried to effect compromise between Colonies and Great Britain joined British army when war was declared R 125

Galloway former division of s w Scotland comprising counties of Kirkcudbright and Wigtown famous for Galloway cattle dairying chief industry

Galloway breed of beef cattle C 146

Galls abnormal growths on leaves stems buds flowers or roots caused by various parasites—especially insects and mites and more rarely by nematodes bacteria fungi slime molds and algae found on almost all forms of plant life but especially common on oak trees, willows roses and goldenrod
insects and mites cause I 159 163 S 347
oak galls or gall nuts O 320 ink from I 150 tanning leather L 148

Gall stereographic projection of map M 84 *diagram* M 85

Gallup George Horace (born 1901) statistician born Jefferson Iowa professor of journalism at Columbia University in 1935 founded American Institute of Public Opinion (The Gallup Poll) for measuring public opinion on specific questions *See also in Index* Institute of Public Opinion

Gallup N M city 150 mi w of Santa Fe pop 9133 in coal mining district trading point for Navajo reservation annual intertribal Indian ceremonial *maps* N 178 U 252

Gallus Saint *See in Index* Gall Saint

Galop a spirited dance in 2/4 time popular in 19th century France and England thought to be of German origin probably received present name in France old names German *Hopser* (hopper) *Rutscher* (slider) also its music

Galop Rapids in St Lawrence River S 19

Galsworthy John (1867–1933) English novelist and dramatist G 6 E 382*a* *See also in Index* Forsyte Saga
chief plays D 136 Justice *picture* D 135
expressionism D 133

Galt (*gȧlt*) **Sir Alexander T** (1817–93) Canadian statesman introduced decimal currency and protective tariff promoted federation of British North American provinces son of John Galt

Galt John *(1779 1839) Canadian* colonizer and novelist, born Irvine Ayrshire, Scotland 1824–29 was promoter of the Canada Company also known for his novels of Scottish life

Galt Ontario industrial center on Grand River about 55 m s w of Toronto pop 19 207 boilers engines textiles brass goods shoes lumber safes *maps* C 72 *inset* C 68

Galtier (*gȧlt yȧ*) **Lucian** (1811 66) French missionary priest gave name to St Paul Minn S 23

Galton Sir Francis (1822–1911) English anthropologist and meteorologist noted student of heredity cousin of Charles Darwin made first attempt to chart weather on extensive scale and propounded anticyclone theory
biometry founded by B 154
contributions to study of psychology I 113–14
eugenics E 413
heredity studies H 344

Galtonia (*gȧl tō nĭ a*) or **summer hyacinth** a genus of plants of lily family native to S Africa flowers on long scape (stem) fragrant white or tinged green bell shaped one common species *G candicans* is often listed as *Hyacinthus candicans*

Galuppi (*gȧ lup pē*) **Baldassare** (1706–85) Italian composer called 'Il Buranello from his birthplace the Island of Burano near Venice noted harpsichord player comic operas enjoyed great popularity also wrote sacred music Browning's A Toccata of Galuppi refers to an imaginary extemporization by the composer

Galvani (*gȧl-va nē*) **Luigi** (1737–98) Italian anatomist discoverer of electric phenomena called galvanism E 308 *picture* E 307

Galvanic cell, or voltaic cell E-308, B-80, *diagram* B-80. *See also in Index* Electric battery and cell

Galvanism, term formerly used for current electricity E-308

Gal'vanized iron, iron coated with zinc to prevent rust Z-351
named for Galvani E-308
plumbing pipes P-323

Galvanized steel, *picture* I-244*d*

Galvanom'eter, device for measuring amount or strength of electric current G-6–7, *diagram* G-6
homemade, *diagrams* E-295
named for Galvani E-308
pyrometer employs P-448
Wheatstone Bridge, *picture* E-300

Gal'veston, Tex., one of greatest cotton-exporting ports in world, pop. 66,568: G-7, *maps* U-253, *inset* T-90, *picture* G-7
government M-451
harbor G-7, H-264, *picture* G-7
level raised D-143
used as pirate base L-86

Galvez (*gäl'väth'*), **José de** (1729–86), Spanish statesman, noted as colonial administrator; important influence in colonizing of American Southwest: *S-308–308a*
San Diego S-40

Galway (*gal'wā*), largest county of Connaught province, Ireland, in middle of w coast (area 2293 sq mi., pop. 160,204); also seaport (pop. 21,316) at head of Galway Bay: *maps* I-227, B-325

Galway Bay, on west coast of Ireland: *reaches 30 mi. inland, Galway County to Clare County: map B-325*

Gama (*gä'ma*) **Vasco da** (1460?–1524), Portuguese navigator and explorer G-7–8, *picture* G-8
Mozambique M-442
results of explorations I-67–8, P-380

Gamagrass, or **sesame grass**, a genus of coarse, drouth-resisting grass (*Tripsacum*) from 1 to 8 feet high; cultivated for fodder in southern United States and Mexico.

Gamaliel (*gə-mā'li-el*), a Pharisee, Paul's *instructor* in law (Acts xxii, 3); advocate in the Sanhedrin of moderate treatment of the Christian apostles (Acts v, 34–9).

Gambarelli, Antonio. *See in Index* Rossellino, Antonio

Gambela, also **Gambela**, a trade center in w. Ethiopia, leased to the government of Anglo-Egyptian Sudan; pop. 600: E-403, *map* A-46

Gambet'ta, Léon (1838–82), French statesman and orator, anti-imperialist during Second Empire and Republican leader during and after Franco-Prussian War; premier in 1881
siege of Paris F-278

Gam'bia, British colony and protectorate in w. Africa on both sides of lower Gambia River; 4070 sq. mi.; pop. 278,858; cap. Bathurst: *map* A-46
relationships in continent, *maps* A-46–7, 41–2, 39

Gambia River, flows n.w. 1000 mi. through French Senegal and British Gambia into Atlantic at Bathurst; navigable for about 350 mi.

Gam'bier, James (1756–1833), British admiral; in command at bombardment of Copenhagen 1807; commander of channel fleet 1808–11; made admiral of fleet 1830
Treaty of Ghent, *picture* M-23

Gambier (*gäm'bēr*), the product of a vine (*Ouropouria gambir*) of the madder family, cultivated in Singapore and the Malay Archipelago; used for tanning and dyeing.

Gamboge (*gäm-bōj'*), gum-resin R-116

Gambrel roof A-319. *See also in Index* Architecture, *table* of terms

Game laws, statutes to protect game and safeguard sporting privileges H-451*b*
for birds, U.S. B-194–6, 159

Gamelin (*gäm-lăn'*), **Maurice Gustave** (born 1872), French general, born Paris; made chief of general staff 1931, inspector general of army 1935, commander in chief 1939; replaced by Maxime Weygand 1940; held in custody by Vichy regime 1940–43, by Germans until 1945.

Game preserves, wildlife refuges C-452*f*. *See also in Index* Birds, *subhead* protection
Fish and Wildlife Service U-363–4

Games G-8–8*f*, *pictures* G-8*a–f*. *See also in Index* Athletics; Play; Sports
babyhood to school days P-316, 319–20, *pictures* P-319–20
billiards B-144, *picture* B-144
bowling B-266, *pictures* B-266
cards playing C-121–2
charades C-186
checkers C-205–6, *pictures* C-205
chess C-224–6
competition in leisure-time activities discouraged L-159
croquet C-518, *diagram* C-518
etiquette, good sportsmanship E-408
horseshoes Q-14
instructions for active games G-8*b–d*
Japan J-305
marbles M-93, *picture* M-93
Middle Ages M-238*c*
Olympic Games: ancient and modern O-379–82, *pictures* O-379–81
ping-pong, or table tennis T-72
play P-315–20, *pictures* P-315–20
quoits Q-14
roque C-518
rules for quiet games G-8*d–f*

Gametocyte (*gə-mē'tō-sit*), a cell that divides to produce gametes M-401

Gametophyte (*gəm'ē-tō-fit*), stage in life history of plants during which the sex organs are produced; also the sexual plant itself. *See also in Index* Alternation of generations
ferns F-53, *picture* S-356
mosses M-405, *picture* M-405

Gamma rays, electromagnetic radiation R-53, 54, M-142*h*, *pictures* R-52, R-30*f*
emission process R-55, *picture* R-54*d*
scintillation counter detects R-54*a*
used in oil-well logging P-172
wave lengths and frequencies *diagram* E-344*b*, *table* R-30
X rays distinguished from R-30*f–1*

Gammer Grethel. *See in Index* Grethel, Gammer

'Gammer Gurton's Garland' M-406

'Gammer Gurton's Needle', an old English comedy first acted in 1566; probably written by William Stevenson; action hinges on Gammer Gurton's loss of her needle.

Gammon Theological Seminary. *See in Index* Atlanta University

Gamolepis (*gə-mōl'ē-pis*), an annual plant (*Gamolepis tagetes*) of composite family, native to S. Africa, wiry, low-growing; yellow or orange daisylike flowers; leaves feathery; used in rock gardens.

Gamopet'alous plants, or **sympetalous plants** F-184, T-185

Gamp, Mrs. Sarah, an unprofessional nurse in Charles Dickens' novel 'Martin Chuzzlewit'; always ready to hire herself out in many capacities for which she is unfitted; noted for bulky umbrella (gamp): N-312

Gananoque (*găn-ă-nŏk'wē*), Ontario, manufacturing town and popular summer resort 18 mi. n.e. of Kingston; pop. 4572: *map* C-72

Ganapati. *See in Index* Ganesa

Gand, Belgium. *See in Index* Ghent

Gander, male goose G-140

Gander Airport, in e. part of island of Newfoundland; international airport used by transatlantic flights; facilities for seaplanes at Gander Lake 1½ miles south: N-139, C-84

Gandhi (*gän'dē*), **Mohandas Karamchand** (1869–1948), Hindu nationalist leader G-8*f–9*, I-68, 68*b*, *picture* G-9
Nehru and N-109
Thoreau influence A-226*d*

Gandhi cap, emblem of Indian National Congress members I-62

Ganelon (*găn-lôn'*), officer or knight of Charlemagne, who in jealousy of Roland betrayed Charlemagne and plotted the battle of Roncesvalles in which Roland was killed; name has since stood for treachery.

Gane'sa, Gane'sha, or Ganapat'i (Sanskrit "lord of the host"), elephant-headed Hindu god of wisdom and remover of obstacles; chief of the minor deities who attend the god Siva.

Gang disk plow P-322

Ganges (*găn'jēz*) **River**, India, sacred river of the Hindus, rises in Himalayas, flows 1540 mi. into Bay of Bengal G-9–10, *maps* I-54, A-406–7, 411
basin I-52
Benares B-123, *picture* B-123
Hardwar, *picture* I-56
tidal bore T-130
valley, population I-56

Gan'glion, cluster of nerve cells N-111, P-245, *pictures* N-112–13

Gang plow P-321, *picture* P-322

Gangway. *See in Index* Nautical terms, *table*

Ganivet (*gä-nē-vā't'*), **Angel** (1865–98), Spanish writer; urged strengthening of national will power ('Idearium español'); also wrote philosophical novels ('La conquista del reino de Maya'): S-327

Gan'net, or solan goose, a large sea bird (*Sula bassana*) of the gannet and booby family (*Sulidae*); entire plumage white, except for black primaries; bill long, pointed, slaty-blue; feet greenish-black: *G-10, picture* G-10
frigate bird robs F-297

Gannett, Ruth Chrisman (born 1896), lithographer, born Santa Ana, Calif.; illustrator of books for children: 'Miss Hickory', written by Carolyn Sherwin Bailey, which received Newbery medal 1947; 'My Father's Dragon' and 'Elmer and the Dragon', both by Ruth Stiles Gannett; 'My Mother Is the Most Beautiful Woman in the World' by Rebecca Reyher.

Gannett Peak, highest point in Wyoming, in Wind River Range; 13,785 ft.: *maps* W-322, U-296

Gannon College, at Erie, Pa.; Roman Catholic; for men; founded 1944; arts and sciences, military science.

Ganymede (*găn'i-mēd*), in Greek mythology, beautiful youth carried off to be cupbearer of Zeus G-10

Ganz (*gänts*), **Rudolf** (born 1877), American pianist and composer, born in Zurich, Switzerland; came to U. S. 1900; director of St. Louis Symphony Orchestra 1921–27; director Chicago Musical College 1928–33, president since 1933.

Gapeworm W-303

Gaplek meal, a cattle food T-14

Gapon (*gä-pōn'*), **Father George** (1870?–1906), Russian priest, revolutionary and government spy; led strikers' march to Winter Palace on Red Sunday (Jan. 22, 1905); believed murdered by revolutionaries he had betrayed.

G A R (Grand Army of the Republic) a society of Civil War veterans organized at Decatur Ill P 98
Gar fish G 10–11 *picture* G 10
evolutionary position F 108
Garage (*gȧ rȧzh* British *găr'ăzh* or *găr'ĭj*) a place for storing and caring for motor vehicles word from French
d nger from carbon m noxide C 120
vertical parking garage *pict re* R 158a
Garakonthie Daniel (1600?–16?6) Onondaga Iroquois chief friendly to French from time he lived with them as treaty h stage (1654) rescued 60 white captives from hostile tribes converted to Cathol icism 1669
Garamond Claude, French printer of 16th century originated fine type designs T 230 *pict re* B 235
Garand (*gă-rănd'*) John C (born *1880*) inventor of the Garand semi auton atic rifle adopted by U S Army in January 1936 born in Canada he became a U S citizen in 1920 a toolmaker he entered U S government service in 1918 worked on small arms development at Springfield (Mass) Arsenal from 1919 until 1953 when he re tired
Garand rifle F 80, M 9 *pict res* F 79 S 379
Garbage collection in cities C 323a
Garber Daniel (born 1880) landscape painter born North Manchester Ind
Garbo Greta (born 1906) American motion picture actress born Stock h lm Sweden won fame in U S in Queen Christina Anna Karenina Camille Ninotchka became U S citizen 1951
Garborg (*găr'bôr'*) Arne Evenaen (18 1–1924) Norwegian novelist lyric poet identified with movement for creating new literary languag based l y on peasant dialect derived from Old Norsk novels show re ligious feeling (Men Peace)
Garces (*găr'thĕs*) Francisco (1738–81) Spanish missionary (Francis can) and explorer founded two m ssi n on Colorado River and was kille l by Yuma Indians there Colora o river named by C 415
Ne a l d list ry N 126
trail in S uthwest S 308a
Garcia (*găr-sē'ȧ* Span sh *gȧr-thē'ȧ*) Manuel (1805–1906) one of the most famous *singing teachers of all* time s n of Manuel Vicente Gar cia f r almost 50 years professor in Royal *Academy of* Music at Lon d n c ntinued private teaching un til his *death* at age of 101 Jenny L nd was one of h s pupils he in vente l the laryng scope
Garcia Manuel Vicente (1775–1832) Spanish singer and teacher father of Maria Malibran and Manuel Gar cia the res lar t groundwork of best modern tea hing
Garcia Gutierrez (*gȧ-thē'ȧ gōō-tē'ĕr-rĕth*) Antonio (1813–84) Spanish dram atist Romantic school play El Trovador a lapted by Verdi in his opera Il Trovatore
Garcia Lorca Federico (1899–1936) Spanish poet and dramatist born Granada work traditional and modern primitive *and cu* ltivated (Lament for the Death of a Bull Gypsy Romancero gitano poetry Blood Wedding Yerma plays) shot at Granada during Spanish civil war
Garcia y Iñiguez (*ē ēn-yĕ' gȧs*) Calixto (1836–98) Cuban patriot twice *imp* s ned in Spain The es say by E bert H bbard A Message to Garcia was inspired by the courage of Andrew S Rowan in carrying *message from* United States to Garcia then co mmander of the rebel army *at opening* of Spanish Amer can War
Gard Roger Martin du *See in I dex* Martin du Gard Roger
Garda Lake largest lake of n Italy exte ding *from Lombard plain into* Tyr lean Alps *map* I 282
Garden Mary (born 1877) operatic soprano born *Aberdeen Scotland* (Mc Isat de Sa ome Louise) director of Chicago Opera C mpany 1921–22 *(first American woman* impresario) *pict re* O 391
Gardena Calif *city 12 mi s w of* Los Angeles pop 14 485 dairies nurseries fur and poultry farms furniture plastics pottery *map inset* C 35
Garden City Kan city 49 mi n w of Dodge C ty on Arkansas River pop 10 905 irrigation farming two airports ardet City Junior Col lege *k 13 maps* K 10 I 282
Garden City N Y residentia lty on w Lo g Island pop 14 486 book and magazine publish g center nearby are Mitchel Air Force Base a t Roosevelt Field airport *map inset* N 204
Garden Club of America a conserva tion organization C 454b
Gardenia evergreen shrub and tree of madder family G 11 *picture* G 11
Garden mint M 281
Garden of Gethsemane (*gĕth sĕm'ȧ nē*) e of Jerusalem *scene* of Christ s agony on night before cru cifixion J 336 340 *pict re* J 337
Garden of the Gods Colo near Colora o Springs C 411
Gardens zoological *See in Index* Zoo
Gardens and gardening G 12–19 *pic tures* G 13–15 18 *c l y pict re* (12 *tab l s* (16–17 19 *See also in I dex* Fruits and fruit growing Fl e t exts *also* names f flowers fruits and vegetables
Amer can Col nies A 193*f*–4
b ll graphy H 395
chem c l gardening P 307 9
fertilizers G 13 15 F 55
flori ulture G 12–18
flowers G 18 *table* G 16 17
formal *pict res* G 13 A 400*g*
hedges H 329 G 15
Iran I 222
Japanese J 301 2 *pict re* J 314
landscaping G 14–15 *pictures* G 12–15
lawn plant ng G 15
old fashioned garden *l art* C 18
plant ng directions for G 13–14
flowers *tabl* G 16–17 vegetables *table* G 19
plant life experiments for home and s hool P 298–301
plant pes s and diseases G 17 *See also in I dex* Insect pests Plant diseases
plastic covers for new plants *pict re* C 163
ro k g *rdens* G 15 17
s il p reparation G 13
sprays and spraying S 356–7 *table* S 357
transplanting G 14
truck gardening G 12
vegetable raising G 12 14 *table* G 19
weeds W 84 5
winter protection C 18
Garden spider S 342 *pictures* S 342 3
sacs for eggs *pi t re* S 343
web S 343 4 *pictures* S 342–5
Garden State popular name *for New* Jersey
Gardiinus *Russia See in Index* Grodno
Gardiner, Sir Alan Henderson (born 1879) Engli h Egyptologist au thority on *Egyptian* language (Egyptian Gram mar The Theory of Speech and Language The Theory of Proper Names) A 179
Gardiner Samuel Rawson (1829–1902) English historian (History of England careful nonpartisan and based on exhaustive study)
Gardiner Stephen (1483?–1555) Eng lish bishop and statesman suc ceeded Wolsey as bishop of Win chester He was largely responsible for fall of Thomas Cromwell lord chancellor 1538–9)
Gardner Mass agricultural trade center 23 mi n w of Worcester pop 19 581 silverware furniture baby carriages *map* M 132
Gardner Island in Pacific *See in In dex* Phoenix Islands
Gareth (*găr'ĕth*) Sir knight of the Round Table R 236
Garfield James Abram (1831–81) 20th president of U S G 20–1 *pic ture of 20*
Blaine secretary of state B 205
Statuary Hall *See in I dex* Statuary Hall (Ohio) *table*
wife and family W 128a
Garfield James R (1865–1950) lawyer public official born Hiram Ohio son of President Garfield secretary of interior 1907–9 lawyer in Cleveland Ohio after 1909
Garfield Lucretia Rudolph (1833–1918) wife of President Garfield W 128a
Garfield N J, city on Passaic River 10 mi n w of New York City pop 27 55) textiles embroidery chemi cals rubber goods m achinery *map* N 164
Garfield Heights Ohio residential and industrial suburb of Cleveland pop 41 862 *map inset* O 357
Gargano (*gȧr gȧ nō*) mo ntainous pen nsula of s Italy extending ab ut 30 mi into Adriatic I 268
Gargantua (*gȧr găn'tōō ȧ*) giant hero of Rabelais s satire of that name whose Gargantuan appetite is proverbial R 19
Gargoyle (*gȧr'goil*) in arch tectural de ora tion A 317
origin F 193
Garibaldi (*găr ĭ bôl'dē* Italian *gȧr bäl'dē*) Giuseppe (1807–82) Italian national hero G 21 *pict re* I 274
birthday celebrated b 59
part in Italy s unification I 273
Garibaldi a fish (*Hypsypops rubi cund s*) most frequently seen through the fa ous glass bottomed boats at Catalina Island nearly a f ot long when full gr wn is pure bright scarlet ab undant in the coral reefs of the tropics
Garibaldi Hymn patri tic s ng of Italy N 41
Garibaldi s scarlet shell (*Antiagaria* diana) color picture S 139
Garland Hamlin (1860–1940) writer born West Salem Wis noted for vigorous portrayal of Midwestern life with strong local color (Main Traveled Roads short stories Son of the Middle Border Daugh ter of the Middle Border Back Trailers from Middle Border) A 229
quoted A 229
Garland Tex industrial town 13 mi n e of Dallas aircraft automobile tires pop 10 571 *map inset* T 90
Garlic onionlike plant of lily family O 383
Garment industry *See in I dex* Cloth ing industry
Garneau (*gȧr nō'*) Alfred (1836–1904) French Canadian poet born Quebec son of François X Gar neau verses marked by sensitive ness (Poésies)
Garneau François Xavier (1809–66)

Canadian historian and writer; born Quebec; his 'Histoire du Canada' a standard historical work: C-106

Garner, John Nance (born 1869), political leader, born Red River County, Tex.; congressman from Texas 1903–33; speaker of House 1931–33; vice-president of U. S. 1933–41
F. D Roosevelt and R-202

Gar'net, semiprecious stone J-349, *picture* C-525
birthstone, *color picture* J-348

Garnet lac L-82

Gar'nett, David (born 1892) English author, grandson of Richard Garnett; called "realist of the impossible" because of his beautiful fantasies ('Lady into Fox': 'Go She Must'); also wrote 'No Love', modern novel, 'Pocahontas' historical romance, and 'War in the Air', a study of the British air war in World War II.

Garnett, Edward (1868–1937), English author and critic, son of Richard Garnett; literary adviser to Conrad and Galsworthy; with his wife, Constance (1862–1946), translated many Russian works; wrote 'Tolstoy, His Life and Writings' and 'Turgenief A Study' edited 'Letters from Conrad' and 'Letters from John Galsworthy'

Garnett, Richard (1835–1906), English librarian and author, keeper of the printed books in British Museum; wrote lives of Carlyle, Emerson, Milton; 'The Twilight of the Gods', a fanciful retelling of myths, with Gosse wrote history of English literature

Garnier, Charles (1606–49), Canadian Jesuit missionary born Paris, France; came to Canada 1636; murdered by Huron Indians

Garnierite (*gär'ni-ēr-īt*), an ore of nickel, *table* M-176

Garnishment, in law. *See in Index* Law, *table* of legal terms

Garonne (*gă-rŏn'*) **River**, chief river in s.w. France; rises in Spanish Pyrenees, flows n. into Bay of Biscay; length 357 mi.: F-261, *maps* F-259, E-416, 425
Canal du Midi F-262

Gar pike, a river and lake fish with long, slender, rounded body P-256

Gar'rick, David (1717–79), British actor and manager G-26, *picture* G-26
pupil of Samuel Johnson J-360, G-26

Garrison, Theodosia (Mrs. F. J. Faulks) (1874–1944), poet, born Newark, N.J. ('The Joy o' Life and Other Poems'; 'Earth Cry and Other Poems'; 'The Dreamers').

Garrison, William Lloyd (1805–79), American editor and leader of abolitionist movement G-26–7, C-331, *picture* G-27
friendship with Whittier W-133
woman suffrage movement W-184

Garrison Dam, in North Dakota M-325*a*, N-282, *map* M-325*a*. *See also in Index*, Dam, *table*

Garter, Order of the D-43
meets at Windsor Castle W-155

Garter snake S-208–9, *picture* S-208

Gar'vin, James Louis (1868–1947), English journalist and publicist, ardent imperialist, most powerful champion of Chamberlain's tariff reforms; editor of the *London Observer*, which he made a great organ of opinion, 1908–42.

Ga'ry, Elbert Henry (1846–1927), financier and promoter, born Wheaton, Ill.; chairman of finance committee and board of directors of U. S. Steel Corporation; Gary, Ind., named in his honor.

TEMPERATURES FOR CHANGES OF STATE IN GASES

Gas	Liquefaction (Degrees, Centigrade)	Solidification (Degrees, Centigrade)
Air (20.9% oxygen)	—147.0	
Carbon dioxide	— 60.0	— 79.0
Helium	—269.0	
Hydrogen	—253.0	—260.0
Nitrogen	—196.0	—253.0
Oxygen	—182.7	—253.0

Gary, Ind., world's greatest steel-producing center; at foot of Lake Michigan, about 30 mi. from Chicago; pop. 133,911: G-27–8, *map* I-78, U-253, *picture* I-71
school system G-28

Gas, for heating and lighting G-30–1, F-314
acetylene A-7–8
balloons use B-28*d*–9
Bunsen burner B-352–3, *picture* B-353
by-products: alum A-181; coal-tar derivatives C-370–1; coke C-380
coal gas G-30: balloons use B-28*d*–9
discovery and development G-30: Bunsen burner B-353
first American city using G-30
heating houses H-322, 323
household hazards H-304, S-8, C-120
meters M-183
natural gas. *See in Index* Gas, natural
Pintsch gas G-31
poisonous P-341, C-120, H-304
producer gas G-31
regulation of companies P-430
storage tanks G-30, *picture* G-30
stove G-31: burner, air supply B-353; cause of backfire F-74
water gas G-31

Gas, in chemistry and physics G-28–30, *pictures* G-28–9. *See also in Index, table* on this page
adsorption of C-385
air A-73, A-453, *diagram* A-455
Avogadro's hypothesis G-29
balloons B-28*d*–9, 30, H-331, H-459
barometer measures pressure B-57–9, *diagrams* B-58–9
colloidal forms C-385
compressed G-28, *diagrams* G-29
inert, or noble C-213, A-460
ionization, how produced E-315
laws of gases G-28–30, *diagrams* G-29
liquefaction. *See in Index* Liquefaction, of gases
molecular activity G-28, 29–30, H-316, M-142*c*, *diagrams* G-29
poison gas P-341: carbon monoxide C-120; coal mines C-368; in warfare C-208, W-222, 223
Schlieren camera used, *picture* I-204
vacuum tubes use E-318
vapor distinguished M-142*d*

Gas, natural G-31–3, F-314, *charts* F-314, P-176, *pictures* G-31–2
Canada: Alberta A-143
fuel for locomotives L-291
geologic age of G-59
helium yielded H-331
hydrogen from H-459
petroleum, associated with P-170
plant in Texas, *picture* T-95
prospecting methods M-268
storage G-33
underwater drilling, *picture* P-181
United States resources G-31, 33, U-319–20, *map* P-169
Arkansas A-360, *picture* A-371
California G-33
Indiana I-84
Kansas K-13
Louisiana L-324
New Mexico G-33
Ohio O-361
Oklahoma G-33
Pennsylvania G-33, P-124
Texas T-78
West Virginia W-111

Gas black, or carbon black. *See in Index* Lampblack

Gascoigne (*găs'koin*), **George** (1525?–77), English writer, stepfather of Nicholas Breton; member of Parliament 1557–59 ('Supposes', earliest comedy in English prose, adapted from Ariosto; 'Certayne Notes of Instruction', considered first English critical essay; 'The Steel Glass', verse satire).

Gasconade River, Missouri, rises in s. and flows n. 200 mi. to Missouri River, *maps* M-312, 318–19

Gas'cony, French Gascogne (*găs-kôn'yĕ*), former duchy in s.w. France; boundaries were Bay of Biscay, Garonne River, and the Pyrenees Mountains *map* F-270
acquired by Henry II H-335
people F-259
redemption of "Landes" S-38

Gascony, Gulf of F-260

Gascoyne River, in Western Australia; flows w. into Shark Bay: *maps* A-478, 488

Gas engine. *See in Index* Diesel engine; Internal-combustion engine; Motor

Gaseous-tidal theory, origin of solar system E-177, P-265

Gas-filled electric lamps E-310

Gas'kell, Elizabeth Stevenson (1810–65), English novelist; many of her books deal with poor workmen in Manchester ('Cranford', a delightful sketch of village life; 'Life of Charlotte Brontë').

Gasket. *See in Index* Nautical terms, *table*

Gaskin, of horse, *picture* H-428*a*

Gas mantle G-31
cerium used in M-265

Gas mask C-208, *picture* C-208
adsorption by charcoal C-385
use in fumigating, *picture* E-216

Gas meter M-183

Gas oil, a medium-grade fraction of petroleum
how made, *chart* P-176–7
uses, *chart* P-175

Gasoline, a fuel liquid distilled from petroleum P-176–8, G-33, *charts* P-175, 176–7
antiknock gasoline G-33
cracking process P-177–8, *table* I-199
ethyl G-33, A-505
fire, chemical foam smothers, *picture* F-88
fire prevention F-90, *picture* F-89
gauge, in airplane A-92, 93
grades G-33
lamp G-31
natural, in Texas T-78
natural-gas supplies G-33
pipelines P-178
refinery, *picture* P-123: fractionating unit, *picture* P-174, *color picture* U-282
service station, *pictures* S-16, P-168
storage, *color picture* U-282

Gasoline gauge A-92, 93

Gasoline tax T-24

Gasometer gas storage tank G 30 *pic t re* G 30
Gaspar (*gȧs per*) one of the Wise Men of the East *See in Index* Magi
Gasparilla Carnival Tampa Fla T 9
Gasparri (*gas pär rē*) **Peter S** (1852–1934) Italian Roman Catholic car d nal secretary of state under Ben edict XV and Pius XI played lead ing part in concordat between the papacy and Italy 1929
Gaspé (*gȧs pā*) **Philippe Aubert de** (1786 1871) Canadian novelist whose Les Anciens Canadiens (The Old Time Canadians) is de tailed picture of seignioral times *C 106*
Gaspé a district and peninsula in s e Quebec projecting into Gulf of St Lawrence and consisting of an el evated plateau traversed by Notre Dame Mts a continuation of the Appalachians of the U S lumber ing and fishing visited by tourists because of scenery and picturesque villages village of Gaspé (pop 1892) scene of Cartier s landing in 1534 Q 4 5 *maps* C 69 73 *p ctures* Q 6 C 95
Cartier erects cross *picture* C 95*a*
Gaspee British vessel burned by Rhode Islanders R 143
Gaspereau fish *See in Index* Alewife
Gaspergou fish *See in I dex* Drum
Gasperi (*gȧs-pē rē*) **Alcide de** (1881–1954) Italian statesman leader Christian Democrats born Tren tino organized anti Fascist resist ance foreign minister 1944–46 prime minister 1945–53 elected president of European Coal and Steel Community assembly 1954 *I 278*
Gasplant an attractive perennial of genus *Dictan nus* with large pin nate leaves and tall purple or white racemes native to Eurasia
how to plant *table* G 16
Gas poisons P 341
Gassendi (*ga sah dē*) **Pierre** (1592–1655) French philosopher and mathematician combined Epicu rean philosophy with Catholic doc trine (Syntagma philosophicum)
Gasser Herbert Spencer (born 1888) physiologist born Platteville Wis co winner with Joseph Erlanger of 1944 Nobel prize (*in medicine*) *for* studies of e ectric impulses car ried by nerves taught at Washing ton University *St Louis 1931–37* at Corne l University Ithaca N Y 1931–35 director Rockefeller In stitute for Medical Research after 1935
Gaston Lucy Page (1860 1924) reformer born Delaware Ohio founded *Anti Cigarette* League 1899 at Chicago worked in Amer ica and abroad for anticigarette legis ation
Gastonia N C textile manufacturing town 20 mi w of Charlotte in farm ing *region* pop 23 069 *maps* N 274 U 253
Gastric juice S 400
d*gestive* action D 91*a diagram* D 91*a*
hydro h oric acid in H 459
pepsin in P 144
Gastropods or **stomach footed mol lusks** a class of mollusks including snails and slugs M 334
Gastroscope instrument for examining the stomach
light used F 310
Gas turbine T 212 *chart* I 186
electric locomotive R 64 T 212
j t aircraft engines *J 342* 4
locomotive engine L 291
tru ks, use in T 195 *picture* T 195
Gas warfare *See in Index* Chemical w arfare
Gas welding W 90
Gat Libya *See i Index* Ghat
Gateleg table *pict re* A 202
Gate of Judgment Alhambra A 167
Gate of Tears *See in Index* Bab el Mandeb
Gate of the Giants Shetland Islands S 148
Gates Doris (born 1901) author of children s books born near San Jose Cal f as children s librarian in San Joaquin Valley she *worked* among boys and girls in migrant camps and a result of this experi ence she wrote Blue Wil ow other books with a Cal fornia set t ng are North Fork and Little Vic
Gates Eleanor (Mrs Frederick F Moore) (1875–1951) n ve st and playw ght born Shakopee Minn *The Biography of a Prairie Girl* Cup d Le Cov Punch The Poor Litt e Rich Girl no el and p ay)
Gates Horatio (1728–1806) American general born n England ser ed in Br tish army in America becom i g a friend of George Washington sett ed in Virginia as a planter in 1772 in Revo ution became a major general in Continental Army in command at victorious Saratoga campaign and later at disastrous battle of Camden S C after Cam den Congress ordered an invest ga tion of his conduct, but later repealed this order
battles of Saratoga S 44
Conway Cabal R 126
forsakes Dekalb at Camden D 47
Gates Sir Thomas (1559? 1621?) first sole governor of Virginia colony (1611–14) set sail from England 1609 in command of fleet carrying colonists to America his ship the *Sea Vent re* was wrecked on Bermudas two new vessels were built and reached Virginia 1610
Gateshead manufacturing town in n e England pop 115 017 opp osite Newcastle on Tyne River here De foe wrote Robinson Crusoe *map* B 324
Gath (*gāth*) ancient Philistine city on border of Judah in s w Pales tine birthplace of Go iath P 902
Gatineau (*gȧ tē nō*) River in Canada flowing s 400 mi into Ottawa River Q 428 *m ap* C 72
Gatling Richard Jordan (1818–1903) inventor born Hertford County N C invented the revolving bat tery gun M 9
Gatling gun M 9
Gator Bowl at Jacksonville Fla F 230
Gattamelata (*gȧt tȧ ma la ta*) cele brated Ital an sold er of the 15th century leader of mercenaries
statue by Donatello S 78*a–b picture* S 78*c*
Gatti Casazza (*gȧt te ka zȧt sȧ*) Giulio (1869–1940) Italian operatic manager director of La Scala Milan director of Metropolitan Opera Co New York City 1908–35
Gatty Harold Amer can aviator round the world flight table A 104
Gatun (*ga ton*) town in Panama Canal Zone pop * 75 also name of dam and artificial lake in Panama Canal P 62 3 *map* P 62
dam P 58 63 *See also in Index* Dam *table*
locks P 62 *pictures* P 57
Gatun Lake Panama P 58 63
Gaucho (*go cho*) cowboy of Ar gentina A 331 2 337 *pict res* A 332 S 284
literature about L 125
n on ment pict re A 336
Gauden John (1605–62) English churchman claimed authorship of celebrated Eikon Basil ke a de fense of Charles I purporting to have been written by the k ng bishop of Exeter and of Worcester
Gaudier Brzeska (*go dya bzhēs ka*) H. (1891–1915) French modernist sculptor geometric high y simpli fied style killed in World War I
Gauge or **gage** a standard measure a device for testing standard measurements also a measuring or record ng instrument
block M 231
firearms J 80
kni ted fabrics F 9
micrometer M 231
railroad track R 61 2 gauges used *in var ous countries R 6*
rain 1 74
wire W 163
Gauguin (*go gȧn*) ***Paul (1848–1903)*** French painter father a French man mother a French Peruvian pioneer postimpressionist in 1883 gave up business and *devoted* full time to painting lived and painted in South Seas much of t me from 1891 especially in Tah ti and *in the* Marquesas Islands where he died
Gaul (*gȧl*) Latin Gallia *name for* distr cts occupied by Celtic peoples (1) Cisa pine Gaul now n Italy (2) Gaul proper or Transalpine Gaul now modern Fran e *and Bel* gium with parts of Holland Ger many and Switzerland
Barbarian invasions E 432 Vandals V 437
conquered by Romans C 163, C 14
Druids in C 163
Gauleiter (*gou lī tēr*) German word meaning district manager under Naz s name of official appointed to manage a political district in Ger many or a foreign territory con quered or controlled by Germany
Gaulle (*gōl*) **Charles André de** (born 1890) French army officer and statesman G 34 W 251 F 272 273 *pictures* G 34 W 271
Gauls Celtic people who early invaded western Europe
capture Rome R 184
in France F 258
nav gation N 79
Gaunt John of *See in Index* John of Gaunt
Gauntlet metal plated gloves intro duced as part of armor of knights about 13th century A gauntlet thrown down was a challenge to fight Term applied to any long loose cuffed glove
Gaur (*gour*) or **gour** wild ox of In dia C 141 *picture* C 141*b*
Gaura (*gô rȧ*) a genus of annual and perennial plants of the evening primrose family native to North America Large hairy leaves form rosette from whi h a ta l ste grows flowers white or rose in loose spikes at top of stem fruit a 4 ribbed nut like capsule
Gauss (*gous*) **Karl Friedrich** (1777–1855) German mathematician and physicist, renowned as master of mathematical analysis founded mathematical theory of electricity unit of intensity of a magnetic field is named for him (Gauss unit)
Gautama (*gou tȧ-mȧ*) or **Cotama** family name of Buddha B 338
Gautier (*gō tya*) **Théophile** (1811–72) French poet novelist and crit ic his personal eccentricities have somewhat obscured his reputation as a literary craftsman of the first rank wrote excellent travel ac counts theater and art criticism (*Emaux et camées* his best poems Mlle de Maupin his greatest

novel; 'Le Capitaine Fracasse', a novel; 'History of Dramatic Art in France'): F-288

Gauze, transparent, loosely woven cotton fabric of many uses; heavier grades are classed as cheesecloth.

Gavarni (*gȧ-vȧr-nē'*) (1804–66), French caricaturist and illustrator; real name Guillaume Chevallier; prolific critic of Parisian life, especially of the poorer and somewhat disreputable classes.

Gav'eston, Piers (*pērz*), **earl of Cornwall** (died 1312), favorite of Edward II of England, served briefly as regent 1308, was banished three times because of greed and insolence, but returned and was beheaded by the barons.

Gavial (*gā'vi-ȧl*), Indian or Malayan reptile of order *Crocodilia*, long, narrow, flat snout with lumpy tip: C-515

Gaviiformes (*gā-vī-i-fôr'mēz*), an order of fish-eating water birds composed of the loons

Gavins Point Dam, in South Dakota, on the Missouri River S-307, *map* M-325*a*

Gavotte (*gȧ-vŏt'*), originally a French peasant dance, merry and light; after its introduction at court in 16th century became quieter and more dignified; popular as a theatrical dance, special music for it written by many composers including Bach, Gluck, and Couperin

Gawaine (*gȧ'wān*), in Arthurian legend, nephew of King Arthur and knight of the Round Table; called "the Courteous"

Gay, John (1685–1732), English poet and dramatist ('Beggars' Opera'; 'Polly'; 'Fables'). *See also in Index* 'Beggars' Opera'
literary friends S-469

Gay, Walter (1856–1937), painter, born Hingham, Mass.; studied and lived in Paris, noted for still lifes; commander Legion of Honor ('Benedicite'; 'Las Cigarreras').

Gay, Zhenya, American artist, illustrator, and author of children's books; noted for distinctive lithographs; animals favorite models, especially cats ('Sakimura').

Gayal (*gā'ȧl*), species of native cattle (*Bos frontalis*) domesticated in n.e. India and regions adjacent for its flesh and skins; closely related to the gaur: C-141

Gayfeather, a perennial plant (*Liatris spicata*) of the composite family, grows wild from Massachusetts and Minnesota to Mexico. Has rough 6-ft. stem springing from cluster of grasslike leaves; flower spikes 4 to 15 in. long of rose-purple, rarely white, bundlelike heads; used in medicine; also called Kansas gayfeather, marsh blazing star, or liatris.

Gay'ley, James (1855–1920), metallurgist, born Lock Haven, Pa.; invented Gayley refrigerated dry-air blast in blast furnaces; 1901–9 first vice-president U.S. Steel Corporation (1901–9).

Gay-Lussac (*gē-lü-sȧk'*), **Joseph Louis** (1778–1850), French chemist and physicist, born St. Léonard, France; professor at École Polytechnique, the Sorbonne, and Jardin des Plantes; made an academician 1806; explained nature of prussic acid; discoverer of important law of gases; pioneer in scientific balloon observations; with Louis Thenard isolated boron.

Gay-Lussac's law. *See in Index* Charles's law

Gay Nineties, term for turn of 19th century in U.S., an era of lavish display and social activity that resulted from accumulation of new wealth and growth of cities; whirl of amusements contrasted sharply with austere life of pioneer days.

Gaza (*gā'zȧ*), Palestine, ancient town 50 mi. s.w. of Jerusalem; most important of the five Philistine cities. It was taken by Alexander the Great, and later became a rival of Alexandria and Athens as a center of Hellenic culture; pop. about 38,000: P-202, *maps* I-256, M-7, P-45

Gazania (*gȧ-zā'ni-ȧ*), a South African genus of perennial or annual plants of the composite family. Some stemless, with leaves in cluster, others short stemmed, all with white, woolly hairs. Flowers daisylike, solitary, on long stems, white, orange, or scarlet, in some, base of rays spotted, hence name peacock gazania (*G. pavonia*). Flowers close at night and leaves turn upward.

Gazara, Canaan. *See in Index* Gezer

Gazelle (*gȧ-zĕl'*), an antelope A-262, *picture* A-263

Gazetteer, a geographic encyclopedia R-88*h*
selected list R-88*h*

Gaziantep (*gä-zē-än-tĕp'*), formerly **Aintab** (*īn-tȧb'*), Turkey, military post and trading center situated 60 mi. n. of Aleppo, Syria, pop. 72,743; textiles· *map* T-215

GCA. *See in Index* Ground Controlled Approach

Gdansk, Poland. *See in Index* Danzig

Gdynia (*gȧ-dĭn'yȧ*), Poland, port on Baltic sea a few mi. n.w. of Danzig, pop. 117,702; construction begun 1921 because Poles were unable to utilize Danzig for naval or military purposes; port opened 1923; large coal exports; *map* E-416

Ge, in mythology. *See in Index* Gaea

Gear, in mechanics, the moving parts or appliances by which motion is passed from one part of a machine to another, *picture* M-161
automobile A-520–2, *diagrams* A-520–1: gear shift lever A-521; timing A-515, *diagram* A-515

Gear, nautical. *See in Index* Nautical terms, *table*

Gear ratio A-520

Geasa, a magic spell M-34

Geatland (perhaps same as Götaland), homeland of 'Beowulf' B-125

Gebal, Lebanon. *See in Index* Byblos

Gebel, or Jebel (*gĕb'ĕl*), Arabic word for mountain.

Geber (*gā'bĕr*) (Abu Musa Jabir ibn Hayyan) (flourished 776), Arabic scientist; held sound views on chemical research; suggested geologic formation of metals
alchemy A-145
discovers nitric acid N-240

Gebhard, Louis A. (born 1896), radio and radar researcher, born Buffalo, N. Y.
pulse transmitter R-28

Geck'o, lizard L-283–4, *picture* L-284
foot, *picture* F-225

Ged, William (1690–1749), Scottish goldsmith and printer, inventor of a stereotyping process.

Geddes, Sir Eric (1875–1937), British political leader, director general of military railways and inspector general of transportation during World War I (1916–17); first lord of the admiralty (1917–18).

Geddes, Norman Bel (born 1893), artist, born Adrian, Mich.; known for work in stage and industrial design; stage sets for 'The Miracle', 'Hamlet'; designs for automobiles, ships, airplanes helped to make streamlining popular
model of ocean liner, *picture* S-428

Geelong (*gē-lông'*), Australia, seaport in Victoria 40 mi. s.w. of Melbourne; pop. 44,641; important woolen trade and manufactures; quarrying: *map* A-489

Geese. *See in Index* Goose

Geese, sacred, how they saved Rome R-184

Gegenbaur (*gā'gĕn-bour*), **Karl** (1826–1903), German comparative anatomist; first to study anatomy from evolutionary standpoint ('Comparative Anatomy of Vertebrates').

Gehen'na, or **Valley of Hinnom**, in Palestine near Jerusalem J-335

Gehrig, Henry Louis (1903–41), American baseball player G-34–5, *picture* G-35. *See also in Index* Baseball Hall of Fame, *table*

Geiger counter, or **Geiger-Müller counter**, instrument for detecting radioactivity R-54*a*, *pictures* R-53, E-456
cloud chamber R-32, *picture* R-31
used in oil-well logging P-172

Geijer (*yā'yĕr*), **Erik Gustaf** (1783–1847), Swedish poet, composer, and historian; professor of history University of Uppsala; wrote stirring music to his own verses.

Geikie (*gē'ki*), **Sir Archibald** (1835–1924), Scottish geologist, born Edinburgh ('Story of a Boulder'; 'Class Book of Geology')
calculates earth's age E-194

Geikie, James (1839–1915), Scottish geologist, born Edinburgh; brother of Sir Archibald Geikie ('The Great Ice Age').

Geisel, Theodor Seuss (born 1904), pen name Dr. Seuss, illustrator and author of books for children; born Springfield, Mass. Children's books include 'And to Think That I Saw It on Mulberry Street', '500 Hats of Bartholomew Cubbins', 'Thidwick: The Big-Hearted Moose', and 'Horton Hatches the Egg'. Wrote scripts for motion pictures 'Gerald McBoing Boing' and 'The 5000 Fingers of Dr. T'.

Geisha (*gā'shȧ*), entertainers, in Japan J-302, D-14*f–g*

Geissler (*gīs'lĕr*), **Henry** (1814–79), German maker of scientific instruments; Geissler tubes named for him.

Geissler tube, a sealed glass vessel containing rarefied gas and electrodes between which high-voltage electricity is passed, causing the gas to glow brilliantly; used principally in spectroscopy· X-328
glowing explained E-318

Gel, in colloid chemistry C-385

Gelada baboon B-2

Gel'atin, or **gelatine**, a proteinlike jelly of unknown chemical composition G-35
colloidal nature C-384, 385
effect of potassium bichromate C-301
glue a form of G-127
photoengraving processes P-210*b*
photographic plates, films P-221
photogravure process P-210*c*
protein in bones B-145
seaweed yields S-95

Gelding, an unsexed male horse H-428

Gelée, Claude. *See in Index* Claude Lorrain

Gelibolu, Turkey. *See in Index* Gallipoli

Gelon (*gē'lŏn*) (died 478 B.C.?), Greek leader, succeeded Hippocrates as tyrant of Gela, Sicily (491 B.C.), Syracuse, of which he became tyrant about 485 B.C, attained great power and riches under his rule, defeated Carthaginians 480 B.C.

Gelsemium (*gĕl-sē'mi-ŭm*), or **Carolina yellow jasmine**, a smooth twining shrub (*Gelsemium sempervirens*) of the loganía family with opposite shining lance-shaped

leaves and small fragrant funnel shaped flowers in axillary clusters rootstock yields drug *gelsemium* used in treating neuralgia convulsions and bronchitis
state flower of South Carolina, *color picture* S 384a
Gelsenkirchen (*gĕl zun kirg ün*) Germany industrial town in Ruhr Valley 8 mi ne of Essen pop 315 460 coal mines iron and steel works, chemical manufactures *map* I 8ef C 88
Gemara (*gĕ ma ra*) part of the Talmud H 327
Gemini (*jĕm i ni*) or Heavenly Twins constellation in zodiac Z 352 *charts* S 373 376 379 381 A 434 *picture* Z 352
named for Castor and Pollux C 135
Gemmae or brood buds *See in Index* Budding
Gemmation *See in Index* Budding
Gems J 346 50 M 268 *pictures* J 349–50 *color pictures* J 347–8 M 264
birthstones *color picture* J 348
British crown jewels I 302–3 *See also in Index* Jewelry and gems *subhead* British crown jewels
cameos 53
chief gem materials J 346 *list* J 348–50
chromium in C 300
corundum varieties E 339
cutting cuts for modern jewelry *pictures* J 350 diamonds D 78 *picture* D 81 machine method J 347–8
imitation making J 347
silicon content S 180
superstitions J 346 349
Gemsbok (*gĕm bŏk*) antelope of south and west Africa (*Oryx gazella*) about 4 feet high straight horns sometimes 3 feet long valued for its flesh and hide *picture* A 263
Gem State or Gem of the Mountains popular name for Idaho I 13
Genabum ancient city in France O 475
Gendarmes (*zhän därm*) name of French national police employed in all departments and possessions
Gender in grammar
nouns N 306
pronouns P 418
Genée (*zhĕ nā*) Adeline (born 1878) Danish dancer spent much of life in England one of greatest exponents of classical ballet American appearances 1908–13 tremendous success with her program Le Danse retired from stage 1917
Genera (*jĕn e ra*) plural of *genus* *See in Index* Genus
General
U S Air Force *table* A 384 insignia *picture* U 238
U S Army A 383 *tables* A 380 384 insignia *picture* U 238
U S Marine Corps *table* A 384
General name of a locomotive used by Confederates in Civil War *picture* C 337
General Accounting Office U S U 368
General Allotment Act of 1887 U S I 110j
General assembly in state government S 385
General Assembly of the United Nations U 240–240a *b* 241 242
General court in state government S 385
General Education Board an organization founded by John D Rockefeller Sr 1902 to distribute his gifts for the promotion of education within the U S without distinction of race sex or creed chartered by Congress 1903
scholarships and fellowships U 403
General Federation of Women's Clubs W 189
General gas law G 29
deviations from G 30
General Grant sequoia tree in Kings Canyon National Park in California N 36
General Grant National Park now part of Kings Canyon National Park N 36
General Land Office U S former bureau of Department of Interior duties taken over by Bureau of Land Management 1948
General Motors Corporation Detroit Mich organized 1908 by William Crapo Durant (1861 1947) as General Motors Company of New Jersey incorporated in Delaware as General Motors Corporation 1916 acquired and consolidated many auto vehicle and accessory companies makes Buick Cadillac Chevrolet Oldsmobile and Pontiac passenger cars accessories and trucks buses and plants in U S Canada and foreign countries *table* I 140
General officer in the U S Army A 383 *See also in Index* General
General of the Air Force top rank in the U S Air Force created by Congress May 1949 wears five stars Henry H Arnold appointed *table* A 384
General of the Armies of the United States I 154
General of the Army top rank in the U S Army created during World War II by Congress Dec 1944 wears five stars Marshall Eisenhower Arnold MacArthur Bradley appointed *table* A 384
insignia *picture* U 237
General Services Administration U S U 368
General Sherman giant tree in Sequoia National Park S 102 N 38b *picture* C 41
General staff body of officers helping commander in chief or chief executive to control air land or naval forces of nation usually direct personnel intelligence training and combat operations logistics
U S Army A 383 insignia *picture* U 238
General theory of relativity R 100
Generations alternation of *See in Index* Alternation of generations
Generator belt *See in Index* Belt generator
Generator electric P 289 92 *pictures* E 290 1 *See also in Index* Electric generator
Genes (*jēnz*) parts of chromosome that transmit heredity H 347–8 *diagrams* H 345 6 *picture* H 347
mutation H 348
Genesee River N Y rises in Pennsylvania empties into Lake Ontario 7 mi n of Rochester 150 mi long R 166–7 *maps* N 198 204
Portage Falls *picture* N 207
Genesis (Greek coming into being) first book of Bible called also Book of Creation tells of creation of world and of founding of Israelite nation and its history to deaths of Jacob and Joseph
Doves Press Bible *picture* B 239
Michelangelo's frescoes M 212 *picture* M 213
Genet (*zhe nĕ*) Edmond C F (1763–1834) Citizen Genêt French diplomat born Versailles *minister to* U S (1793–94) at time of French Revolution sent to induce U S to declare war on Great Britain U S requested his recall for unneutral acts married daughter of Gov George Clinton and became American citizen
outfits privateers W 24
Genetic psychology or developmental psychology P 427a
Genetics the scientific study of heredity *See in Index* Heredity
Geneva (*gĕn ē vą*) N Y *city on* Seneca Lake 38 mi se of Rochester pop 17 144 preserved goods cutlery optical supplies stoves boilers nurseries Hobart College *map* N 204
Geneva French Genève (*zhe nĕv*) Switzerland city on Lake Geneva pop 145 473 G 35–6 S 479 *maps* S 475 F 259 E 425 *pictures* G 36
center of Calvinism C 49
League of Nations L 142
Red Cross organized P 87
Geneva Lake also Lac Leman largest lake in Switzerland in sw border ing on France 224 sq mi G 36 *maps* S 475 F 259 E 416 *picture* G 36
geological formation L 87
Rhone flows through P 146
Geneva arbitration conference which settled the *Alabama* claims A 129
Geneva Bible published 1560 by English refugee reformers in Geneva Switzerland based on an existing English translation Its quarto size reasonable cost and marginal commentary made it popular with Puritans B 134
Geneva College at Beaver Falls Pa founded 1848 by Reformed Presbyterian church arts and sciences
Geneva Convention (Red Cross Treaty) R 87
flags F 137 *color picture* F 134
Geneva Naval Conference (1927) C 468
Geneviève (*zhĕ nĕ vyĕv*) Sainte (AD 422?–512) a patron saint of Paris said to have saved Paris from Attila's Huns by her prayers caused church to be built over tomb of St Denis festival Jan 3
Genghis (Jenghiz or Jinghis) Khan (*gĕng gis kän*) (1162–1227) conqueror who first raised Mongols to power and swept over Asia G 37 M 345 *picture* G 37
descendants seize India I 67
followers called Tatars T 23
Wall of Genghis Khan *map* M 343
Genie (*jē ni*) or jinni (*ji nē*) supernatural being with magic powers appears frequently in Oriental literature
Arabian Nights *picture* S 409
Génissiat Dam in France on the Rhone River *See also in Index* Dam *table*
Genius according to the belief of the ancients a guardian spirit good or bad who presided over the birth of a child and had charge of its destiny The term has come to be applied to an extraordinary gift or aptitude especially as displayed in creative work
Edison's definition P 235
Genlis (*zhän lēs*) Stephanie comtesse de (1746 1830) French author and educator tutor to Philippe Egalité's children including Louis Philippe anticipated many modern methods of teaching
Gennargentu (*gen när gĕn tū*) Mount highest range in Sardinia near center of island highest point 60 0 ft
Gennesaret Lake or Sea of *See in Index* Galilee Sea of
Genoa (*jĕ nō ą*) Italian Genova (*jĕ nō vą*) Italy seaport on Mediterranean gateway to n Italy pop 678 000 G 37–8 I 277 *maps* I 262 I 416 425 *pictures* I 268 G 37
defeated at Chioggia by Venice V 448 G 38
medieval trade center T 165 C 37 8
war with Pisa C 38 P 273

Mediterranean in n.w. Italy, with city of Genoa at its head; broad southern portion known as Ligurian Sea · *map* I-262
Genocide (from *genos*, meaning race, and *cide*, meaning killing) United Nations convention on U-242
Genova, Italy *See in Index* Genoa
Genre (*zhän'rŭ*) painting P-38
Genro (*gen'rō'*), in Japanese government the unofficial body made up of elder statesmen who formerly advised the emperor J-320
Genseric (*gen'sĕr-ik*), or **Gaiseric** (A.D. 390?–477), Vandal king; conquered n. Africa including Carthage (429–439); plundered Rome (455): V-437–8
Gent, Belgium. *See in Index* Ghent
Gentian (*gen'shăn*) an autumn flower G-38, *pictures* G-38, *color picture* F-176
Gentian, drug G-38
Gentian family, or Gentianaceae (*jĕn-shi-a-nā'sē-ē*), a family of plants and shrubs including the gentians exacum buckbean centaury and water snowflake
Gentile (*jĕn-tē'lā*), **Giovanni** (1875–1944), Italian philosopher; minister of education under Mussolini; assassinated
Gentileschi (*jĕn-tē-lĕs'kē*), **Orazio** (1565?–1647), Italian painter, born Pisa; decorated interiors of several palaces in Rome in 1626 settled in England where Van Dyck painted his portrait paintings vivid in color but lack composition, his best works 'Moses Saved from the Waters' 'Annunciation', 'Joseph and Potiphar's Wife' His daughter, **Artemisia Gentileschi** (1590–1642), born Rome became popular in England as a portrait painter and equaled her father in historical painting ('Judith and Holofernes': 'Christ among the Doctors').
'Gentle Art of Making Enemies, The', a book of satire and wit directed against his critics by James Abbott McNeill Whistler W-121
Gentlemen's agreement, an agreement binding only as a matter of honor and not legally enforceable, as between business rivals (to fix prices or standardize sales methods) or between nations
in business M-360
United States and Japan I-48
Genus (*jē'nŭs*), a group of related species of plants or animals B-152, B-178
Geocentric theory, theory that all the heavenly bodies revolve around earth; sometimes called Ptolemaic theory; disproved by Copernicus, Kepler, Galileo, James Bradley.
Geode (*jē'ōd*), in geology R-169
Geod'esy, measurement of the earth or large portions of the earth's surface S-457
Geodet'ic surveying, surveying in which the curvature of the earth is taken into account S-457, 458
U. S. Coast and Geodetic Survey U-366
Geoduck (*gē'ō-dŭk*), or **gweduc**, a clam C-339
Geoffrey (*jĕf'rĭ*) **of Monmouth** (1110?–54), Welsh historian, bishop of St. Asaph ('History of the Britons')
Arthurian legends A-394
Geoffrey Plantag'enet (1113–51), count of Anjou, husband of Matilda (daughter of Henry I of England), and father of Henry II S-390
meaning of "Plantagenet" H-335
Geoffroy-Saint-Hilaire (*zhō-frwä-săn-tē-lĕr'*), Étienne (1772–1844), French naturalist, pre-Darwinian believer in mutability of species, founder of the science of teratology, or study of monsters.
Geographical distribution of animals and plants. *See in Index* Ecology
Geographical Society, American G-47
Geographic Society, National G-47
Geography G-39–48, *map* G-42, *pictures* G-39–41, 43, 45–6, *Reference-Outline* G-47–8. *See also in Index* Earth; World; the continents, countries, and chief regions by name; *also topics below by name*
ancient knowledge G-45–6, P-430
bibliography G-48
civilization influenced by G-39–44, C-325–6, M-245–6
climate C-348–51, *Reference-Outline* G-47
cultural G-45
directions D-94–101, *diagrams* D-94–5, *maps* D-96–9
economic G-45
human race, distribution of R-23, P-370–4, *graph* P-371, *map* P-371
lakes L-87
location, relative and exact G-42, *maps* G-42
maps and map making M-84–91*b*, *maps* M-86–8, 90–1, 91*b*, *pictures* M-84–5, 98, *table* M-91*a*
mathematical G-45
migration of people influenced by M-245–6
modern G-46–7
mountains M-439–40, *Reference-Outline* G-47
natural regions of earth W-201–2, *table* W-202
oceans and water formations O-327–36, *Reference-Outline* G-48
people how they live P-142–142*f*, *pictures* P-142–142*f*, *Reference-Outline* P-142*e–f*
physical G-45
picture books, value L-208
plants and animals, distribution of (ecology) E-212–22, *pictograph* E-215, *pictures* E-213, 216–17, 219, 221, *color pictures* E-212
political G-45
rainfall R-70–2, D-152–3, *map* R-71
regional G-44–5, 47
rivers R-155–7, *picture* R-156
rocks and soil R-167–70, S-226–31, *map* S-230, *pictures* R-168, S-227–9, 231, *Reference-Outline* G-48
social studies include S-218*c*, *picture* S-218*d*
societies, associations, and publications G-47
systematic G-44–5
universe A-437–40
waters of the earth E-180–1
Geography, Division of, U. S. U-363
Geological Survey, U. S., a bureau (founded 1871) of the Department of the Interior U-363, G-53
Geology, the science of the earth, its origin, evolution, materials, and physical structure G-49–60, E-193–4, P-406*d*–7, *pictures* G-49–56, 58, *table* G-57. *See also in Index* Animals, prehistoric; Earth; Fossils; Prehistoric life; and chief topics listed below
Antarctic icecap studies A-260
bibliography H-393–4
carboniferous period, or Coal Age G-59, 56, *diagrams* C-362, *table* G-57; ferns F-52–3; fish F-107; Ice Age I-6; insects I-160, C-373; North America N-264
caves C-156–8
chalk formation C-182: Cretaceous period G-59; Dover cliffs D-125; foraminifera P-423, C-182
climatic changes G-59, 60: Ice Age I-4–7, *maps* I-5–6, *pictures* I-4, 7
clay deposits C-349
coal formation C-361–3, *diagrams* C-362: ferns F-52–3, *picture* C-362; geological periods G-59, 56, *table* G-57; peat P-108–9
continental shelves E-178
continents N-264–5, E-193–4
core and crust of earth E-172–4, G-53–4
deserts D-73–73*b*, *map* D-73*a*
earth: age of E-194, G-57, 60, *diagram* G-58, *table* G-57; origin of E-177–8
earthquakes E-195–7, E-186, *picture* E-195
eras of geologic time G-56–60
erosion E-181–4, G-50: weathering E-185
fault G-54
gas, natural G-33, G-59
geologist, training and work G-53
geysers Y-337, G-106
glaciers G-115–16, *picture* G-115
hot springs S-357
Ice Age I-4–7, *maps* I-5–6, *pictures* I-4, 7
igneous rocks R-167, 169, M-266–7, G-49–50, L-138
lakes L-87, I-4
land bridges between continents: Africa and Asia A-36, M-20; Africa and Europe S-311; Antarctica and other continents A-260; Scotland and North America B-327
lava L-138, *picture* L-138
metamorphic rocks R-168, 169–70, M-266, G-52, *diagram* G-49, *picture* G-50
minerals M-261–7, *picture* M-265, *color pictures* M-263–4
mountain formation M-439–40, G-50, 54, 59, E-181, 186, 188–90, *diagram* G-55
ocean basins O-327–36, E-194
periods of geologic time G-56–7
petroleum deposits P-169–70, G-59, *diagram* P-170
prospecting, mineral M-268: radio detection of deposits R-41
rivers R-155–6, E-187–8
rocks R-167–70, *picture* R-168
sedimentary rocks R-168, 169, M-266, G-50–2, *pictures* G-50, 51
social studies include S-218*c*, *picture* S-218*d*
soils S-226–31, *map* S-230, *pictures* S-227–9, 231
valleys V-435, E-188, *diagrams* E-188
volcanoes V-518–20, *color pictures* V-521–2, *diagrams* V-518–19
warping, folding, and faulting E-186
Geomagnetic poles, points at which the axis of the earth's magnetic field cuts the surface of the earth; the north geomagnetic pole is near Etah, Greenland (78.5° N. and 69° W.), the south geomagnetic pole is in Antarctica (78.5° S. and 110° E.): A-473, *diagram* A-473
Geom'etry, the science that treats of mathematical relations and measurements in space G-60–6, *diagrams* G-60–4
analytic G-65, C-18*e*
non-Euclidean G-65–6
Pythagoras P-448
surveying applications S-457–8
Geomorphology, defined E-180. *See also in Index* Earth
Geophysical prospecting, for minerals M-268
short-wave beams R-41
Geophyte (*jē'ō-fīt*), a plant with an underground root or tuber B-348
Geopolitics (*jē-ō-pŏl'i-tiks*), a political doctrine which explains the domestic and foreign political policies and developments of a nation by its geography. *See also in Index* Haushofer, Karl
George, Saint (died 303), patron saint of England G-66, *picture* G-66
festival day (April 23) F-58
how he slew the dragon D-126: depicted by Cranach, *picture* G-66

George I (1660–1727) king of England G 66 *picture* G 67
makes South Carolina royal province S 294
George II (1683–1760) king of England G 66 *picture* G 67
Chatham and C 198
royal library given to British Museum B 246
Seven Years War S 107
War of Jenkins Ear E 369 L 296
George III (1738–1820) king of England G 66–7, *picture* G 67
American colonists protest against D 32 33 35–6
American Revolution R 122 128
Benjamin West and W 92
Chatham and C 198
Seven Years War S 107
Wentworth *picture* W 58
William Pitt P 274
George IV (1762–1830) king of England G 67
George V (1865–1936) king of England G 67–8 *picture* G 68
addresses Imperial Conference (1930) *picture* H 423
George VI (1895–1952) king of England G 68 *picture* G 68
royal coach in coronation *picture* G 67
George I (1845–1913) king of the Hellenes son of Christian IX of Denmark C 193
George II (1890–1947) king of the Hellenes proclaimed 1935 following abdication of father Constantine G 194 195
Venizelos and V 446
George (16 Jr 1708) prince of Denmark and husband of Queen Anne of England
George David Lloyd *See in Index* Lloyd George
George Frances (born 1870) actress born New York City married William A Brady producer debut 1894 in New Boy starred in Divorcons Road to Rome First Mrs Fraser
George Henry (1839–97) author and political economist born Philadelphia Pa named single tax and made it a social creed
Progress and Poverty A 230
George James Zachariah (1826–97) statesman born Monroe County Ga chief justice Mississippi supreme court 1879–81 U S senator after 1891 *See also in Index* State Story Hall (Mississippi) *table*
George (*gā or gĕ*) **Stefan** (1868–1933) German poet opposed naturalism verse classical and scholarly with emphasis on form (The Year of the Soul Songs of Dreams and Death "The Star of the Covenant")
George W L (1882–1926) English novelist and essayist especially concerned with study of women and their problems (A Bed of Roses The Second Blooming Blind Alley Woman and Tomorrow)
George William Reuben (1865–1936) sociologist born West Dryden N Y founded George Junior Republic
George Junior Republic G 68
George Fort trading post on upper Fraser River B C established 1807 by Simon Fraser now called Prince George
George Lake long narrow lake in e New York inclosed by mountains 32 mi long famed for beauty battles in French and Indian War *maps* N 196 205
George Green Act U S (1936) L 257
George V Coast district in Antarctica between 142°20 and 153° explored and named by Sir Douglas Mawson expedition 1911–12 *map* A 259
George Junior Republic G 68
George Medal Great Britain D 40
George Peabody College for Teachers at Nashville Tenn organized 1910 to succeed Peabody Normal College founded 1875 founded by the George Peabody Fund library school graduate school L 101
George Pepperdine College at Los Angeles Calif founded 1937 arts and sciences graduate studies
Georgetown capital British Guiana on coast of South America part of Dutch Guiana River L 73 (1) imports and exports L 223 *maps* G 223 S 252
Georgetown historic town in part of Washington D C W 32 *pictures* M 118
Georgetown Ky agricultural and tobacco trading center in heart of Inland Empire Bluegrass Region Royal Scots settled 1790 K 31
George Town Penang capital of Settlement of Penang location of Malaya Penang Island 2½ mi from W coast Malay Peninsula port 189 largest port in the Straits *pictures* I 123 A 407
Georgetown College at Georgetown Ky Baptist founded 1829 arts and sciences
Georgetown University at Washington D C Roman Catholic for men founded 1789 arts and sciences foreign service coeducational in dentistry law languages and linguistics medicine nursing graduate school *map* W 30
Georgette crepe a thin dull silk fabric with crepelike surface
George Washington Birthplace National Monument in Virginia N 34–5, *map* N 18 *picture* W 25
George Washington Carver National Monument in Missouri N 35 C 131 *map* N 18
George Washington Memorial Bridge N Y over Hudson River B 308 *pictures* N 219 W 162 B 308 *See also in Index* Bridge *table*
George Washington Memorial Parkway along Potomac River N 38 *t*
George Washington University at Washington D C chartered 1821 as Columbian College since 1904 under present name nonsectarian junior college Columbian College (senior college) education engineering government law medicine pharmacy divisions of special and university students *graduate* council *map* W 30
George Westinghouse Bridge Pittsburgh Pa *See in Index* Bridge *table*
George Williams College at Chicago Ill chartered 1890 became George Williams College 1933 arts and sciences group work physical education graduate studies
Georgia a southern Atlantic state of U S cap Atlanta 58 876 sq mi pop 3 444 578 G 69–81 *maps* G 76–7 70 73 U 253 274–5 *pictures* G 69 79–81
agriculture G 70 72
bird state G 71
Capitol State A-451 *pictures* G 79 69
cities G 79 73 *map index* G 75 78 *See also in Index* names of cities
Atlanta A 450–1 *picture* A 451
Augusta A 472 *picture* A 472
Savannah S 51
climate G 71
communication G 71
counties *map index* G 74
dams G 69 79
education G 72 81
elevation G 71
extent G 71
Fact Summary G 71–4
flag F 130–130*a* *color picture* F 126
flower state G 71 *color picture* S 384*a*
forests G 70 national and state 73 *map* G 73
geographic region in which situated *maps* U 250 271 5 The South U 272–83
history G 79 81 74
Spanish capitulate G 79
part of Carolina land grant S 284
colonization under Oglethorpe G 79 O 346
Revolutionary War G 81
Indian lands J 287
Civil War G 81 C 433 A H Stephens S 391 Chickamauga Battle of C 336 Sherman's march to the sea S 148
readmission into the Union G 81 85*b*
industries G 70 79 72 A 450–1, *b* 51
land use G 71
minerals G 70
motto G 71
mountains G 69–70 *Appalachian Highlands A 276*
name origin of and nickname G 71
natural features G 70 71
natural resources G 69 70 71
occupations G 71
parks monuments and other areas G 72–3 *maps G 73 N 18*
Fort Frederica N M N 33
Fort Pulaski N M N 34
Okmulgee N M N 38
pine G 70 P 258
places of interest G 72–3 *map* G 73
population G 71
products G 69 70 79 72
prohibition colonial days P 416
rivers G 71
seal G 71
song state G 71
trade wholesale and retail G 72
transportation G 69 71
tree state G 71
Georgia (Georgian Soviet Socialist Republic) also **Sakartvelo** a republic of Russia along Black Sea 27 000 sq mi pop 3 505 000 cap Tiflis G 81 *maps* R 260 267 *picture* G 40 people R 262 C 156
Georgia Strait of arm of North Pacific Ocean separating s half of Vancouver Island from mainland of Canada *maps* U 307 W 44
Georgia University of at Athens Ga state control chartered 1785 opened 1801 arts and sciences business administration education forestry journalism home economics law pharmacy veterinary medicine graduate school *picture* G 80
Georgia Institute of Technology at Atlanta Ga state control opened 1888 aeronautics architecture chemistry ceramic civil electrical industrial and mechanical engineering industrial management, physics textile school graduate studies
Georgian Bay an arm of Lake Huron H 452 *maps* G 181 C 72
Trent Canal C 109 H 452
Georgian Bay Islands National Scenic and Recreational Park in Ontario Canada *N 38f map N 38f*
Georgian Court College at Lakewood N J Roman Catholic for women founded 1908 arts and sciences
Georgian style in decoration I 178–9, *pictures* I 180–1 183
Georgian style of architecture A 203 *pictures* A 322 E 369*f* *table* I 178
Georgia pine Southern yellow pine or longleaf pine P 258 259 G 70
Georgia State College for Women Milledgeville Ga established 1889

college of arts and sciences, and teachers college.
Georgia Warm Springs Foundation, at Warm Springs, Ga., about 40 mi. n.e. of Columbus; established 1926 by President Franklin D. Roosevelt for the treatment and care of persons who have been crippled by infantile paralysis· R-201
Little White House R-218
'Georgics', poem by Vergil V-452
Geosynclines, in geology G-56
Geotropism
insects I-160
plants P-296: bean rootlet, *pictures* B-84
Geraint (*gĕ-rānt'*), Sir, knight in Arthurian legends, hero of Tennyson's 'Geraint and Enid'.
Geraldine (*jĕr'ăl-dĭn*) the Fair, Lady Elizabeth Fitzgerald (died 1589), celebrated in some of the earl of Surrey's sonnets; in late romantic legend, object of Surrey's devotion.
Gera'nium, flowering plant G-82, *color pictures* F-172, P-286
cutting, how to make, *picture* P-300
Geranium family, or Geraniaceae (*jĕ-rā-nĭ-ā'sē-ē*), a family of plants and shrubs, including the geraniums, cranesbill, herb-robert, heronsbill, alfilaria and storksbill.
Gérard (*zhā-rär'*), **François Pascal, Baron** (1770–1837), French painter; pupil of David; classical subjects, 'The Three Ages' 'Daphnis and Chloe', historical, 'Battle of Austerlitz'; more than 300 portraits ('Madame Récamier').
Gerard', James W. (1867–1951), lawyer and diplomat, born Geneseo, N.Y.; ambassador to Germany 1913–17 ('My Four Years in Germany').
Gerbera (*jĕr-bē'ra*), or **Gerberia**, a genus of perennial plants of the composite family, native to S. Africa and Asia. The Transvaal daisy (*Gerberia jamesoni*) has bright orange flowers high above the woolly leaves; some have white, pink, or red flowers.
Gerbert. *See in Index* Sylvester II
Gerfalcon H-292
Gerhardt (*gĕr'härt*), **Paulus**, or **Paul** (1607–76), German hymn writer; considered greatest of his time; strong supporter of Lutheranism ('O Sacred Head Once Wounded'; 'Commit Thou All Thy Griefs').
Geriatrics (*jĕr-ĭ-ăt'rĭks*), a department of medicine which deals with old age and its diseases C-454*a*, *picture* C-454. *See also in Index* Old age
Géricault (*zhā-rē-kō'*), **J. L. A. Théodore** (1791–1824), French painter, leader of Realistic school and of revolt against David's Classicism.
Gericke (*jĕr'ĭk*), **William F.** (born 1884), plant expert, born Fremont, Neb. P-308–9
Gérin-Lajoie (*zhā-răn'lā-zhwä'*), **Antoine** (1824–82), French-Canadian novelist and poet, born Yamachiche, Quebec; editor *La Minerve* (Montreal); one of founders and for several years president L'Institut Canadien ('Un Canadien', poem; 'Jean Rivard', novel; 'Dix ans d'Histoire du Canada').
Gerizim (*gĕr'ĭ-zĭm* or *gē-rī'zĭm*), Mount, in Palestine; across narrow valley from Mt. Ebal; 2849 feet.
Germ, the embryo, usually small, in a seed or egg E-268. *See also in Index* Embryo; Embryology
Germ. *See in Index* Microbe
German, Sir Edward (1862–1936), English composer; incidental music for several Shakespearean plays; comic operas ('Nell Gwyn' and 'Merrie England'), symphonies, suites, rhapsodies, songs.
German Affairs, Bureau of, U. S. U-358
German Baptist Brethren. *See in Index* Dunkers
German carp. *See in Index* Carp
German cockroach, or **croton bug** C-373
German Confederation (1815) G-97
German Democratic Republic. *See in Index* East Germany
German East Africa, former name of Tanganyika Territory. *See in Index* Tanganyika Territory
'Germania', by Tacitus T-1
Germanic languages, or **Teutonic languages** G-82, 83
English E-373–4
Germanic peoples, or **tribes.** *See in Index* Teutonic tribes
German'icus, Caesar (15 B.C.–A.D. 19), Roman general, nephew of Tiberius; had nearly conquered Germany when jealousy of Tiberius led to his recall and transfer to Syria; allegedly poisoned at instigation of emperor.
Germanium, a gray, brittle, metallic element of silicon family; found in argyrodite and other rare minerals. Discovered 1886 by German chemist Clemens Winkler. In World War II, came into use as crystal rectifier in radar units, later in radios; also used in special optical glass which has high refractive index: *tables* P-151, C-214
transistor, used in E-321
German language G-82, 83
alphabet A-178. *See also in Index* Alphabet, *table*
in Switzerland S-480
number of people speaking L-98
German literature G-82–6, *pictures* G-82–5, *Reference-Outline* L-99. *See also in Index* names of chief writers
Austrian contributions A-494
chief writers, *lists* G-86, D-136
drama G-83, 85, 86, D-132, 133–4
chief dramatists, *list* D-136
Passion Play (Oberammergau) O-322, *picture* O-323
folk and fairy tales G-216, 217–18, L-271, S-411, *list* S-420–1
German mile, *table* W-87
German New Guinea N-143
German philosophers P-204
German Reformed Church. *See in Index* Reformed churches
German shepherd dog, sometimes called **police dog**, *color picture* D-116, *table* D-118*a*
war service D-110*a*, *picture* D-110*a*
German short-haired pointer, dog, *color picture* D-112, *table* D-118
German silver, an alloy N-234, C-475
electrical conductivity, *picture* E-298
Germans in America
colonial immigration A-197, 198, V-478, 490: North Carolina N-278; Pennsylvania P-138; Wisconsin influx W-178
German Southwest Africa, former German colony. *See in Index* South West Africa
Germantown, Pa., former n.w. suburb, now district, of Philadelphia; scene of Revolutionary War battle (Oct. 4, 1777) where Washington's surprise attack against Howe proved unsuccessful: W-77
historic buildings, *picture* A-204
Germantown Academy, in Philadelphia, Pa., *picture* E-243
German tribes. *See in Index* Teutonic tribes
German-Volga Republic, Russia, autonomous republic on lower Volga; 10,800 sq. mi.; 1939 pop. about 605,000; people descended from German immigrants; Soviet government transported them to Siberia when Nazis advanced toward Volga during World War II; republic abolished 1941.
German Workers' party, nucleus of Nazi organization H-383, 385
Germany, a land of central Europe, divided into two countries, West Germany (area 95,867 sq. mi.; pop. 49,732,824; cap. Bonn) and East Germany (area 41,535 sq. mi.; pop. 18,517,567; cap. East Berlin); G-87–104, *maps* G-88, E-416, 424–5, *pictures* G-87, 90–102, *Reference-Outline* G-103–4
agriculture G-92–3, B-82, S-53 *pictures* G-90, 91
antiquities: prehistoric man, remains M-69
architecture: castles, *picture* G-95; classic, *picture* B-126; gate tower, *picture* G-92; Gothic A-317, *picture* C-386; modern, *pictures* G-92, A-319; Lutheran Cathedral, *picture* B-127
army: army uniform U-234
arts
drawing D-140*a*, *picture* D-140*b*
engraving E-386, 387, *picture* E-385
lace, *pictures* L-79
metalwork M-179, *picture* M-178
painting P-27*a–b*, *color pictures* P-27*b*, *Reference-Outline* P-38*a*
pottery and porcelain P-397, 399, *picture* P-393
sculpture: neoclassicism S-79
wood carving W-190*b*
Baltic coast B-37
banks and finance G-98: first savings banks B-48
bibliography G-104
books and book trade B-249, 238, 248: binding B-241; book plates B-247; manuscript writing B-235
canals G-94, B-127, *map* G-88: Kiel C-108, *maps* G-88, N-301, *inset* G-88, *picture* G-92
cities G-93–4, 95, *list* G-87, *Reference-Outline* G-103. *See also in Index* names of cities
Aachen A-1–2, *picture* A-1
Berlin B-126–30, *pictures* B-126–9
Bonn B-228
Bremen B-300
Cologne C-385–6, *picture* C-386
Dresden D-143
Essen E-398
Frankfort-on-the-Main F-278–9
Hamburg H-251–2, *picture* H-251
Hanover H-260
Heidelberg H-329–30
Leipzig L-158
Munich M-449–50, *picture* M-450
Nuremburg N-313–14, *picture* N-313
Oberammergau O-322–3, *pictures* O-323
climate G-89–91
clothing. *See in Index* Clothing, *subhead* Germany
colonies G-97, W-239, *map, inset* A-47: Pacific Islands G-221
commerce G-94
barter policy I-196
Berlin B-127
Bremen B-300
economic nationalism I-196
exports and imports. *See in Index* Trade, *table*
Hamburg H-251–2
Hanseatic League H-260–1
medieval T-165
per-capita foreign trade, *table* I-192
ships, tonnage S-161
under republic G-98
under Hitler G-99, I-192, 195
contributions to civilization C-328–9
culture G-95
customs G-92
Christmas C-294*b*, *picture* C-296: tree legends C-294
decorations of honor D-40
education
history G-95, E-263: under empire G-95; under Hitler G-99, E-263
schoolroom, *picture* G-94

universities G 95 U 400 404 Berlin B 128 Bonn B 228 Heidelberg H 330 *picture* G 101, Leipzig L 158
emigration to U S I 45–6 48 *chart* U 311
fairs Cologne *picture* G 93 Leipzig L 158
flags Middle Ages F 136 *color picture* F 132 West and East German republics F 136*b* *color picture* F 132 Nazi H 386
foreign relations *See in Index* Germany history of
forests G 93 *picture* G 90 Black Forest B 203–4 conservation G 93 Harz Mountains H 280
furniture M 179
government free cities B 300 H 252 socialism S 216 S 330 D 65 social legislation S 218 under empire G 97–8 under republic G 98 under Nazis G 98–100 H 353 under Allied occupation G 100–2
historic divisions list G 87 *See also in Index* names of divisions
history *See in Index* Germany history of
hollyhock F 59
hydroelectric power *table* W 69
industrial regions G 93–4 P 424*a*
industries G 93–4 *Reference Outline* C 103 beer M 450 dyes D 165 porcelain P 397 399 *pictures* P 393 toys D 122 122*a* *pictures* C 93 Allied occupation restrictions G 100 1
labor L-75 arbitration A 295 under the empire B 198 L 70*d* under Nazi regime F 44 G 99
lakes G 89
language *See in Index* German language
libraries L 183 186
literature *See in Index* German literature
minerals G 93 B 82 H 280 bismuth B 198 coal G 93 S 53 potash I 390 G 93
mountains G 89 Alps A 179 80 Black Forest B 203 Harz H 280
music M 460–5 light opera O 396–7 opera O 388–9, Wagnerian festivals W 2
national songs N 42
natural features G 87 89 *list* G 87, *Reference Outline* G 103
navy N 93 Helgoland as naval base H 331
Passion Play (Oberammergau) O 322 *picture* O 323
people G 87 91–2
children G 95 *pictures* G 91 94 B 83 Nazi training C 99
how the people live *pictures* G 90 1 93–4 100
racial classification F 23 *chart* R 22
political divisions *table* G 89
products *list* G 87 *Reference Outline* G 103
puppets P 440
radio F 49
railroads R 127 F 278 A 1
relationships in continent *maps* E 416–17 419–20 429 429*d*
religion G 87
rivers G 89 Danube D 15 Elbe E 288 Rhine R 133–4, Vistula V 493
roads B 127 *picture* G 95 Unter den Linden B-126 127, *picture* B 128
shelter *pict res* B 82–3 N 313 S 144*a* castles *picture* G 95
Space Travel Society for S 309*a*
transportation *See in Index* Germany *subheads* canals railroads rivers roads
Germany East *See in Index* East Germany
Germany history of G 96–102 *chart* H 364 6 *pict res* G 96 102 *Reference Outlines* G 103–4 H 376–7 *See also in Index* names of chief events states and historical characters For lists of rulers see in *Index* H ly Roman Empire Prussia
Beginnings and Middle Ages (to 1517) G 96 7
Huns invade H 451
Celts C 163
Christianity introduced B 228
under Charlemagne C 186–8
Partition of Verdun C 98
Holy Roman Empire H 408–9 A 496–7
Otto I the Great O 430
Henry IV's conflict with pope H 334–5 G 214
Hohenstaufen rulers H 406
Great Interregnum A 496 G 97
Hohenzollerns H 281
Frederick II F 281–2
Golden Bull G 97
Hapsburg rulers A 496, H 281–2
Hanseatic League H 260 1
work of Teutonic Order C 523
Reformation and religious wars (1517 1648) R 91–3 *historical setting* G 97
Reformation R 91–3 *pictures* R 91 2 *Luther* L 352–3
Charles V G 190 A 496 7 wars with Francis I F 278
Peasants Revolt R 92
Thirty Years War T 118–19 G 233–4 *pictures* T 118–19
Rise of Prussia (1648–1871) P 424–424*a* G 97
Hohenzollern line H 406
Frederick the Great F 282
War of the Austrian Succession A 497 8 M 95
Seven Years War S 107 8 A 498
Napoleonic Wars P 424*a* results G 97
Holy Roman Empire A 498
Congress of Vienna G 97
Revolution of 1848 C 97 P 424*a* effect on literature G 85
William I W 135 6
Bismarck's work B 197–8 G 97
Schleswig Holstein seized D 71
Seven Weeks War with Austria P 198 A 498
North German Confederation G 97
Franco Prussian War F 277–8
Bismarck's part B 198
fate of Metz M 184
empire proclaimed at Versailles V 463
Under the empire (1871–1918) G 91–3 97–8
cartels M 360
William II W 136
Triple Alliance T 434
colonial expansion G 97
Africa A 50
Morocco incidents M 395
Theodore Roosevelt's influence R 222
Pacific Islands P 11 Samoa S 35
Shantung S 134
Venezuelan affair and U S V 444
World War I W 215–32 *maps* W 217 222 224 *pictures* W 215 219 221 223 225–7 229 231–2 241–4 *See also in Index* World War I chronology
reasons for entering W 216
Zimmermann note M 207 W 147
military events W 219–21 222–32
Hindenburg's command H 356
naval operations W 223–5
Wilson's 14 Points W 148 9 W 240
peace settlement W 239–40
responsibility W 219 244
national debt after *table* N 17
revolution of 1918 W 231 2
Under the republic (1918–33) G 98
peace signed with U S W 240
reparations problems W 241–3
relations with France F 269–70
seizure of the Ruhr W 241–2
Allied armies leave Rhineland G 98
moratorium H 421 423 W 243 *picture* W 244
League of Nations *picture* W 242
postwar economic situation W 243
Hindenburg G 98 H 356–7
peace treaties criticized W 244
The Third Reich (1933–45)
Hitler Nazism H 383–5 G 98–100
anti Semitism H 383 J 354 G 98–9
education L 263
Rhineland reoccupied W 244
intervention in Spain S 322*a* *picture* S 322*b*
Rome Berlin Axis B 435 W 246, 252 G 99 I 275
Austria annexed A 495
appeasement policy and Munich Pact E 371 F 272 B 436 Czechoslovakia *dismembered C 536*
Baltic states occupied L 276
Russian pact W 247 G 99 R 291
World War II W 245–72 276–84 294 6 G 99–100 J 371 *maps* W 256 265 268 *See also in Index* World War II chronology
defeat and partition of Poland W 248 276 P 345
Danzig annexed D 17 W 247
seizure of Denmark D 71–2 W 249
invasion of Norway N 304*b* W 249 50 276
Luxemburg occupied L 354 W 250
invasion of Belgium B 117 W 250
Netherlands invasion N 122 W 250
Italy's entry into war I 275 W 250
invasion of France W 250 277 surrender and armistice W 251
Alsace Lorraine A 181
battle of Britain W 251–2 277
new order alliance W 252
in Rumania I 254 W 255
in Bulgaria B 350 W 255
control of Hungary W 255
conquest and partition of Yugoslavia Y 347 W 255
in Greece G 194–5 W 255
in Russia G 100 I 291–2 W 257–8 264 268 *maps* W 268
declares war on U S W 259
V bombs *See in Index* V bombs
aerial bombardment W 267 B 130
driven from North Africa W 263
submarine warfare W 252 260 266
fights Allies in Italy W 264 279–80
driven from France W 270
Allied invasion W 271–2 282–4
Hitler dies W 271 H 385
Results of World War II
surrender and occupation W 271
national debt after *table* N 17
Allied administration G 100–2 *map* G 89 Berlin airlift B 130 G 102
education F 263
war crimes trials G 101 W 299*a* *picture* W 299*b*
war damage G 100 *pictures* G 100
peace treaty problems G 101–2 W 300
West Germany's peace contract with Allies U 394*b* G 103
Germany West *See in Index* West Germany
Germ cells L 233 *diagram* H 346
Germicides A 265 *See also in Index* Antiseptics
Germination start of growth of a seed or egg germ B 148
bean *pict res* B 84
mangrove M 77
Germ theory of disease D 103–4 M 165 *See also in Index* Disease *subhead* germ theory
Gérome (*zhā rōm'*) Jean Léon (1824–1904) French painter and sculptor noted for portrayal of historical and

classical scenes ('Gladiators before Caesar'; 'Slave Market in Rome')
'Caesar and Cleopatra', *picture* C-343
Greek actors, *picture* D-130

Geronimo (*jĕ-rŏn'i-mō*) (1829–1909), leader of Chiricahua division of Apache Indians, born Arizona, led brutal raids on both sides of Mexican border; surrendered to U.S. troops 1886; sent to Fort Pickens, Fla., as prisoner of war later transferred to Indian Territory; name used by American paratroopers as battle cry in World War II because of his surprise attacks.

Gerould, Katharine Fullerton (1879–1944), essayist and story writer, born Brockton, Mass. ('Vain Oblations'; 'Modes and Morals')

Gerry (*jĕr'i*), **Elbridge** (1744–1814), statesman, born Marblehead, Mass.; one of signers of Declaration of Independence; member of Constitutional Convention; governor of Massachusetts 1810–12
Gerrymander named for G-104
signature reproduced D-37
vice-president M-24
'X Y Z' affair X-332

Gerry, Elbridge T. (1837–1927), philanthropist, born New York City; grandson of Elbridge Gerry; founder of the Society for Prevention of Cruelty to Children, often called the "Gerry Society"

Gerrymander (*jĕr-i-măn'dĕr*, also *ĕr-i-măn'dĕr*) G-104, *picture* G-104

Gershwin, George (1898–1937) American composer G-104–5, O-398, *picture* G-104
'Porgy and Bess', *picture* O-397

Gertrude, Saint (the Great) (1256–1302), German Cistercian nun and mystic writer, born Thuringia; patroness of West Indies, festival November 15

Gervais (*zhĕr-vĕ'*), **Emile** (born 1900), Canadian writer and Roman Catholic priest; won Canadian Book of the Year for Children award 1952 for 'Monseigneur de Laval'.

Geryon (*jĕ'ri-on*), a monster in Greek mythology H-342

Gesner, Konrad von (1516–65), Swiss naturalist, born Zurich; collected plants and animals; his 'Historia Animalium' is often considered foundation of modern zoology.

Gesneria (*jĕs-nē'ri-ą*) **family**, or **Gesneriaceae** (*jĕs-nēr-i-ā'sē-ē*), a family of plants and shrubs, native to the tropics and subtropics, including African violet, gloxinias, cape-primrose, and episcias.

Gessler (*jĕs'lĕr*), legendary official defied by William Tell T-55

Gesso (*jĕs'sō*), in art, a raised ground of plaster for painting or for relief form of sculpture; used in mural painting, also in decorating polychromy, used in S-74

Gest (*jĕst*), **Morris** (1881–1942), Russian-American theatrical producer, born Vilna; with F. Ray Comstock, 1905, produced 'The Miracle'; brought Chauve-Souris and Moscow Art Theatre to U. S.; director motion pictures after 1926.

Gestalt (*jĕ-shtält'*) **psychology** P-426–7
influence on education E-247

Gestapo (*jĕ-shtä'pō*) contraction for *Geheime Staatspolizei*, German secret police organized by Adolf Hitler 1933 and headed by Heinrich Himmler 1934–45; G-99

Gesta Romanorum (*jĕs'tą rō-mą-nō'rŭm*), collection of tales from Roman sources, compiled in Middle Ages; source of plots for Gower, Chaucer, Shakespeare.

Gestation, the period of pregnancy in mammals; time between conception and birth during which the young develop, usually in the uterus, of the mother. The gestation period differs with the species and may vary considerably for individual births for the same animal. Typical gestation periods for some common mammals are: man, 280 days; hamster, 16 days; mouse, 21 days; rat, 22 days; rabbit, 32 days; guinea pig, 62 days; house cat 55–56 days; dog, 63 days; lion, 16 weeks hog, 16–18 weeks; sheep, 21–22 weeks; monkey, 6 months; cow, 9 months; horse, 11 months.

Geta (*jĕ'tą*), shoes of Japan J-303

Gethsemane (*jĕth-sĕm'ą-nē*), garden e. of Jerusalem; scene of Christ's agony on night before crucifixion: J-336, J-340, *picture* J-337

Getters, in light bulbs V-434

Gettysburg (*jĕt'iz-bûrg*), Pa., borough 35 mi. s.w of Harrisburg; pop 7040: *map* P-133
Eisenhower farm near, *picture* E-287*f*

Gettysburg, battle of (July 1–3, 1863) G-105–6, H-255, *maps* G-105, C-335
Meade at M-148
Pickett's charge, *picture* C-330

Gettysburg Address, by Abraham Lincoln G-106
text L-250

Gettysburg College, at Gettysburg, Pa.; Lutheran; founded 1832; arts and sciences.

Gettysburg National Military Park, in Pennsylvania G-106

Geum (*jē'ŭm*), a genus of perennial plants of rose family; leaves from root are lobed, those on stems, bractlike; flowers red or yellow, single or double; also called avens.

Geyser (*jī'zĕr*) G-106
Iceland I-10, *picture* I-10*b*
New Zealand N-227
Yellowstone National Park Y-337, *picture* Y-339

Gezelle, Guido (1830–99), Flemish poet, born Bruges, Belgium; educated as a priest; lived at Courtrai for 28 years as a curate; his poems, written in the dialect of West Flanders, are deeply religious.

Gezer (*jē'zĕr*), or **Gazara**, ancient royal city of Canaan 20 mi. n.w. of Jerusalem; important frontier post in Maccabean wars
calendar and potsherd, *picture* A-179, *table* A-178

Gezireh, or Gezira (*jĕ-zē'rą*), wedge-shaped plain between White Nile and Blue Nile in former Anglo-Egyptian Sudan; irrigated from 50-mi. lake, created by 2-mi. dam (opened 1926) across Blue Nile, which can flood 2800 miles of canals; after 1939 mostly in province called Gezira, or Blue Nile (area 54,775 sq. mi.; pop. 1,779,756).

Ghadames, Libya. *See in Index* Gadames

Gharapuri. *See in Index* Elephanta Isle

Ghat, or Gat (*jăt*), town and oasis of Sahara in s.w. Libya; pop. 732: *map* A-46

Ghats (*jŏts*), in India, landing places at edge of rivers
Ganges B-123

Ghats, two mountain ranges parallel with e. and w. coasts of peninsula of India, known as Eastern and Western Ghats I-53, *map* I-54

Ghazni (*jăz'nē*), strategic town in e. Afghanistan on route between India and Persia; taken by English 1839 and 1842; seat of medieval Empire of Ghazni, which rose to its height of power and wealth under reign of Mahmud of Ghazni: *map* A-33

Ghebers (*jē'bĕrz* or *jā'bĕrz*), **Gabers, Guebers, Ghavers**, name given in Iran (Persia) to followers of Zoroaster; known in India as Parsees. *See in Index* Zoroaster

Ghee (*jē*), semifluid butter B-364*b*, B-341

Ghent (*jĕnt*), Belgium, also Gand or Gent, picturesque city; pop. 166,096: G-106–7, *maps* B-111, E-416, 424
altarpiece, 'The Adoration of the Lamb', *picture* M-465
book trade, medieval B-238
lacemaker, *picture* B-113
medieval trade center B-115: guildhalls, *picture* G-228

"Ghent, great bombard of," a cannon A-400

Ghent, Treaty of, ending War of 1812 between U. S. and Great Britain (1814) W-14, *picture* M-23
Clay helps draft C-341

Ghent azalea, a hybrid A-542

Gherkin (*jĕr'kĭn*), type of cucumber used for pickling C-529

Ghetto (*jĕt'ō*), Jewish quarter of a city; in medieval times an urban section where Jews traditionally were required to live; segregation of Jews in ghetto made enforceable by law under Pope Paul IV in Rome 1555; also enforced in Frankfort, Prague, Avignon, Venice, and other European cities; gradually abolished in 19th century, but re-established by Nazis during World War II.

Ghibellines. *See in Index* Guelfs and Ghibellines

Ghiberti (*jē-bĕr'tē*), **Lorenzo** (1378–1455), Italian sculptor G-107
Baptistery doors G-107, I-279, S-78*a*, *picture* R-105

Ghilzai (*jĭl'zi*), Afghan race A-31

Ghiordes, or Turkish knot, in weaving R-248

Ghirlandaio (*jĕr-län-dä'yō*), **Domenico** (1449–94), Italian fresco painter; greatest of a family of Florentine painters; tendency toward realism and individual expression; scenes from life of St. Francis and 'Adoration of the Shepherds' (1485) in Sassetti Chapel, St. Trinita Church, Florence
Michelangelo apprenticed to M-212

Ghostfish. *See in Index* Wrymouth

Ghost flower, or Indian pipe, a plant. *pictures* F-316, N-50

'Ghosts', play by Ibsen (1881); shows in the life of Oswald Alving the relentlessness of inherited evil, and in the life of Mrs. Alving that virtues may become vices when not directed with intelligence and truth.

G.I., abbreviation for government issue, or general issue, of clothing and equipment in armed services. In World War II became slang term designating army enlisted men and various army practices, such as
G. I. haircut, G. I. inspections
G. I. Bill of Rights E-256, T-200*b*, U-404, *table* V-466*a*

Giacometti (*jä-kō-mät'tē*), **Alberto** (born 1901), Swiss sculptor, born Stampa, near St. Moritz: S-83

Giacosa (*jä-kō'zä*), **Giuseppe** (1847–1906), Italian dramatist
chief works I-260

Giambologna. *See in Index* Bologna, Giovanni da

Giannini (*jä-nē'nē*), **A(madeo) P(eter)** (1870–1949), banker, born of immigrant parents at San Jose, Calif.; in 1904 organized at San Francisco, Calif., the Bank of Italy which grew into the Bank of America National Trust and Savings Association (a state-wide banking system with more than 500 branches in 1953)
school savings T-126

Giant human H 424 425
in circus C 314–15 *picture* C 312
Giant in myth and story
Cyclops C 533
Giant Despair in Pilgrim's Progress B 355
Gulliver's Travels G 229, S 470
Norse mythology O 340
Prometheus P 417
Titans T 405
Giant arborvitae *See in Index* Western red cedar
Giant cactus common name of several large cacti especially the saguaro C 9 10 *picture* C 213 *color picture* C 11
saguaro state flower of Arizona *color picture* S 384a
Giant chinquapin or golden leaved *chinquapin C-237*
Giant clam C 339 S 139b, *picture* C 339
Giant fir grand fir or lowland white fir evergreen tree (*Abies grandis*) of pine family native from Vancouver Island to California and Montana Grows 80 ft to 200 ft Leaves to 2¼ in long notched at tip with 2 white bands on underside Cones oblong bright green to 4 in long Sometimes called silver fir yellow fir western white fir and grand white fir Marketed as white fir
Giant Mountains also Riesengebirge (*rē'zən gə bir'gə*) highest range of Sudeten Mts between Silesia and Lohemia highest point the Schneekoppe (5266 ft)
Giant ox name once given to urus C 141
Giant panda a rare bearlike mammal (*Ailuropoda melanoleuca*) found in highlands of central Asia *picture* P 25
discovery of E 456
export forbidden Z 359
food in captivity Z 357
Giant pig prehistoric animal P 406c *picture* P 406 f
Giant's Causeway natural formation of close fitting prismatic columns of basalt rock on n coast of Northern Ireland *picture* I 231
Giant schnauzer dog *table* D 118a
Giant Sequoia S 101–2 *picture* S 102
Giant squid S 359 O 337 338, *picture* O 337
sperm whale attacks W 114
swordfish attacks S 485
Giant tortoise (genus *Testudo*) T 158 T 224 G 3
Giant water bug or electric light bug W 65 *picture* W 64
Giant wheel bug *See in Index* Assassin bugs
Giauque (*ge ōk'*) William Francis (born 1895) *American chemist* born Niagara Falls Ontario on faculty University of California since 1922 his demagnetization method enabled scientists to produce temperatures within a few thousandths of a degree (F) of absolute zero received the 1949 Nobel prize in chemistry for his investigations of the properties of substances at extremely low temperatures
Gibara. *See in Index* Jibaro
Gibault (*zhē bō'*) Pierre (1737–1804) Roman Catholic missionary born Montreal labored at Kaskaskia Vincennes and Cahokia aided George Rogers Clark by securing friendship of colonists and Indians around Vincennes (1778)
Gibbon Edward (1737–94) English historian his Decline and Fall of the Roman Empire is a monumental work of prodigious learning and brilliant style L 98c
association with Samuel Johnson L 378b
quoted on Arthurian legends A 394
Gibbon a small East Indian ape with long arms G 107 A 271 *pictures* M 348 A 271
Gibbons Grinling (1648–1720) English wood carver did work for Christopher Wren and for royalty finest production ceiling at Petworth (in Sussex) made for duke of Devonshire excelled in elaborate delicate carving influenced work of Chippendale
St Paul's choir stalls *picture* W 190a
Gibbons James Cardinal (1834–1921) Roman Catholic prelate and public leader born Baltimore Md bishop of Richmond Va 1866 archbishop of Baltimore 1877 created cardinal 1886
buried in Baltimore B 41
Gibbons vs Ogden in constitutional law L 349
Gibbon's (*gib'ənz*) moon M 386
Gibbs Arthur Hamilton (born 1888) American author born London England brother of Sir Philip Gibbs and Cosmo Hamilton (Gun Fodder war biography The Hour of Conflict Soundings Harness Undertow novels)
Gibbs James (1682–1754) English architect influenced by Christopher Wren his best work includes St Mary le Strand and St Martin in the Fields London and Radcliffe Library at Oxford
St Martin in the Fields *picture* L 299
Gibbs James Ethan Allen (1829–1902) inventor born Raphine Va S 117
Gibbs Josiah Willard (1839–1903) physicist born New Haven Conn professor of mathematical physics Yale outstanding in thermodynamics and electromagnetics C 222
Hall of Fame *table* H 249
Gibbs Sir Philip Hamilton (born 1877) British editor war correspondent and novelist brother of Arthur Hamilton Gibbs and Cosmo Hamilton (novels The Middle of the Road Sons of the Others The Amazing Summer The Interpreter autobiography Crowded Company)
Gibeon ancient city of Palestine probably existed on site of modern small village of El Jib 5 mi nw of Jerusalem
G I Bill of Rights E 256 L 404, T 200b *table* V 466a
Gibraltar British naval base on Mediterranean pop 23 32 G 107–8 *maps* S 312 E 416 425 *picture* G 107
caves C 158
siege (1779–81) G 108
Gibraltar Strait of passage 40 mi long 9 to 15 mi wide between Spain and Africa connecting Atlantic with Mediterranean *maps* S 312 A 42 E 419
Gibraltar of America name sometimes applied to city of Quebec
Gibraltar of the East Aden Arabia A 21
Gibraltar of the North Sea Helgoland H 331
Gibran (*jə brän'*) Kahlil (*kə lēl'*) (1883–1931) Syrian American writer and artist born Lebanon came to live in United States in youth wrote first in Arabic later in English poetic and mystical in his writings whether in prose or verse and in his symbolical drawings (The Prophet Secrets of the Heart Tears and Laughter)
Gibson Charles Dana (1867–1944) illustrator born Roxbury Mass master of black and white drawing skillful portrayer of society life creator of the Gibson girl
Gibson John (1790–1866) British sculptor introduced color after Greek fashion in tinted Venus (Sleeping Shepherd Mars and Cupid statue of Queen Victoria)
Gibson Katherine (born 1893) author of children's books born Indianapolis (Goldsmith of Florence a book of great craftsmen Golden Bird ancient legends)
Gibson Wilfrid Wilson (born 1878) British poet (Stonefolds Borderlands Neighbors depicting inner life of working people)
Gibson Desert in e part of Western Australia site of experimental rocket range 200 mi wide operated by government *maps* A 488 478
Giddings Franklin H (1855–1931) sociologist born Sherman Conn professor sociology Columbia University (The Principles of Sociology The Scientific Study of Human Society)
Gide (*zhēd*) André Paul Guillaume (1869–1951) French essayist and novelist fine stylist keen psychological observer liberal thinker won 1947 Nobel prize in literature (novel The Counterfeiters critcism Imaginary Interviews Travels in the Congo Journals) L'Immoraliste I 289
Gide Charles (1847–1932) French economist wrote much on cooperative movement in France and cooperation of intellectual workers in different countries
Gideon religious *reformer* judge and mighty warrior deliverer of Israel from Midianites (Judg vi viii) J 352
Gideons popular term for members of the Christian Commercial Travelers Association of America first group formed 1899 in Janesville Wis publish magazine distribute Bibles to hotel rooms Army Navy and Air Force schools hospitals prisons
Gielgud (*gil gud*) Sir (Arthur) John (born 1904) English actor director and producer born London noted as Shakespearean actor outstanding in role of Hamlet (Early Stages autobiography)
Gieseking (*gē'zə king*) Walter (born 1895) German pianist born Lyons France of German parents toured widely noted especially for interpretation of Debussy
Giffard (*hə fär'*) Henri (1825–82) French engineer invented dirigible balloon run by steam B 34
Gifford Walter Sherman (born 1885) industrial and civic leader born Salem Mass president American Telephone and Telegraph Company 1925–48 chairman Board of Directors 1948–50 director Council of National Defense World War I appointed by President Hoover director of National Unemployment Relief 1931–32 U S ambassador to Great Britain 1950–53 *picture* U 367
Gifts *See also in Index* Foundations and charities
Christmas C 294 Boxing Day C 298
etiquette E 407
Gigantopithecus prehistoric man M 70
Gig headed snipe *See in Index* Woodcock
Gigli (*jēl'yē*) Beniamino (born 1890) Italian dramatic tenor began as choir boy sang in opera in Italy

with Metropolitan Opera Co., New York City; voice of beautiful quality.

Gigue (*zhēg*), or **jig**, a sprightly dance, probably of English origin spreading to continent in 17th century; rhythm typically a multiple of three; derivation thought to be from Italian *giga* ("fiddle") *jig* also loosely applied to lively dance with no set pattern, in music, last movement of classical suite *See also in Index* Suite
Irish jig F-192*c*

Gijón (*hē-hōn'*), Spain port for rich mining district in center of n coast on the Bay of Biscay pop 110 985 with suburbs, watering place *map* E-425

Gil, Emilio Portes. *See in Index* Portes Gil Emilio

Gila (*hē'lä*) **Cliff Dwellings National Monument**, in New Mexico N-35, N-181, *map* N-18

Gila monster L-283, *picture* L-283
food in captivity Z-357

Gila River, broad and shallow stream 630 mi long rises in Sierra Madre in s.w. New Mexico and crosses Arizona to Colorado River *maps* U-252, 297, A-353, N-179. *See also in Index* Coolidge Dam

Gilbert, Sir Alfred (1854–1934) English sculptor and goldsmith (statue of Queen Victoria for Winchester, England memorial to duke of Clarence at Windsor Castle)

Gilbert, Cass (1859–1934), one of foremost American architects born Zanesville Ohio, designer of many buildings the Minnesota Capitol, the Woolworth Building and U. S. Custom House, New York City, planned University of Minnesota and University of Texas
Capitol, W. Va., *picture* W-110

Gilbert, Henry Franklin Belknap (1868–1928), composer, born Somerville, Mass.; one of the first to emphasize use of Negro musical idiom in his works

Gilbert, Sir Humphrey (1539?–83), English navigator, half-brother of Sir Walter Raleigh; seeking the Northwest Passage (1583), took possession of Newfoundland for Queen Elizabeth I, first English colony in North America (though it lasted but a short time); lost at sea on return voyage: A-190

Gilbert, Sir John (1817–97), English painter and illustrator; great historic themes of vigorous design and color.

Gilbert, Seymour Parker (1892–1938), lawyer and financial expert; born Bloomfield, N. J.; assistant secretary of treasury 1920–21; undersecretary of treasury 1921–23; agent general for reparations payments of Germany, 1924-30.

Gilbert, William (1540–1603), English scientist, called "father of electric science" M-42, E-307

Gilbert, Sir William Schwenk (1836–1911), English poet and dramatist G-108, *picture* G-108
comic operas O-398: 'Pirates of Penzance', *picture* O-396
quoted P-334
'Trial by Jury' G-108, E-382

Gilbert and Ellice Islands Colony, British colony in Pacific including Ellice Islands, Fanning Island, Washington Island, Ocean Island, Christmas Island, Phoenix Islands, and Gilbert Islands; seat of government on Ocean Island; total area about 200 sq. mi.; pop. 35,824: *map* P-16–17. *See also in Index* names of islands

Gilbert Islands, group of coral islands on equator in mid-Pacific; 166 sq. mi.; pop 27,824; under British protection since 1892; included in Gilbert and Ellice Islands Colony since 1915 *map* P-16
coconut fiber armor A-376
people P-4, *picture* P-3
World War II W-263, 288

Gilbert Peak, in Uinta Mts., n.e. Utah (13,422 ft.), *map* U-416

Gil Blas (*zhēl blás*), the hero of a famous novel ('The Adventures of Gil Blas de Santillane') by Le Sage. Serving 15 masters, he travels through Spain having many adventures The book imitated the Spanish picaresque, or rogue, novel.

Gilboa Dam, in New York A-283

Gilboa, mountain range in Palestine, scene of battle in which Saul and Jonathan were slain.

Gild. *See in Index* Guild

Gilder, Richard Watson (1844–1909), poet and editor, born Bordentown, N. J. ('Five Books of Song')
sonnet P-336

Gildersleeve, Virginia Crocheron (born 1877), educator, born New York City; professor of English at Barnard College 1900–1911 and dean 1911–47, known for work in broadening women's higher education.

Gilding, use of gold leaf G-133–4
bookbinding B-240, *picture* B-241
sculpture W-190*b*

Gilead (*gil'ē-ăd*), mountainous region in ancient Palestine, e. of Jordan River and s. e. of Sea of Galilee; spices, myrrhh, and balm.

Gilead, balm of. *See in Index* Balm of Gilead

Giles (*jīls*), **Saint** (died 712?), patron saint of beggars and cripples; hermit and Benedictine abbot of France; festival September 1.

Gil'gal, ancient city in Palestine in Jordan Valley between Jericho and river, where Israelites first encamped after crossing the Jordan (Josh. iv).

Gilgamesh (*gil'gą-mĕsh*), legendary king of Babylonia, hero of an epic poem written on clay tablets, found in the ruins of Nineveh: B-7

Gilia (*gil'i-ą*), a genus of plants of phlox family, found in western N. America; leaves lance-shaped or finely cut; flowers funnel-shaped or saucer-shaped in thimblelike heads. Thimble flower (*G. capitata*) has lavender blue heads; used as an everlasting; standing-cypress (*G. rubra*) grows to 6 ft., leaves needlelike; birds-eyes (*G. tricolor*), flowers bell-shaped, violet, shading brownish-purple to yellow.

Gill (*gil*), **Eric Rowland** (1882–1940), English sculptor and stone carver; work reflects a deeply religious spirit; famous for carving of 'Stations of the Cross' in Westminster Cathedral; wrote on esthetics ('Beauty Looks after Herself').

Gill, Sir David (1843–1914), Scottish astronomer, born Aberdeen; director of observatory, Cape of Good Hope 1879–1907; pioneer in using photography to catalog stars, particularly in vast survey of southern heavens 1885–1900.

Gill (*gil*), a unit of liquid measure, *table* W-87

Gill (*gil*), of mushrooms M-455
amanita, *picture* M-455
shaggy-manes M-457

Gill, organ for breathing under water
embryo vertebrates V-464: chick E-338
fish F-101, 102, *pictures* F-101, R-117
mollusks M-334

Gillespie, John Birks (Dizzy) (born 1918), Negro jazz trumpet player and bandleader, born Cheraw, S. C.; exponent of "bebop" music.

Gillette (*jī-lĕt'*), **William** (1855–1937), actor, stage manager, and playwright, born Hartford, Conn.; did notable work in 'The Admirable Crichton' and 'Dear Brutus'; most famous as actor in his own dramatization of 'Sherlock Holmes'; also wrote and acted in 'Held by the Enemy', 'Secret Service'; promoted naturalism on American stage
Gillette Castle at East Haddam C-448

Gilliflower. *See in Index* Stock; Wallflower

Gill net F-113, *picture* F-112

Gillot (*jil'ō*), **Joseph** (1799–1873), English pen manufacturer P-116

Gilman, Charlotte Perkins (1860–1935), American writer and lecturer on labor and feminism ('Woman and Economics'; 'The Crux'; 'His Religion and Hers').

Gilman, Daniel Coit (1831–1908), scholar and educator, born Norwich, Conn.; president of University of California and first president of Johns Hopkins University and of Carnegie Institution of Washington.

Gilman, George F. *See in Index* Great Atlantic & Pacific Tea Company

Gilman, Lawrence (1878–1939), music critic and author, born Flushing, N.Y.; on staff of *Harper's Weekly* 1901–13, *North American Review* 1915–23, *New York Herald Tribune* 1923–39 ('Music and the Cultivated Man'; 'Toscanini and Great Music').

Gilman, Nicholas (1755–1814), political leader, born Exeter, N.H.; delegate to Congress from New Hampshire (1786–88); to Constitutional Convention (1787); signed the Constitution of the U.S.; Federalist member of Congress (1789–97); Jeffersonian Republican senator (1804–14).

Gilmore, Patrick Sarsfield (1829–92), American bandmaster, born Ireland; musical conductor at National Peace Jubilee 1869, and World's Peace Jubilee 1872; leader of famous 22d Regiment Band, New York City; sometimes wrote music under pen name Louis Lambert: B-46*c*
'When Johnny Comes Marching Home' N-41

Gil'pin, John, in Cowper's 'John Gilpin's Ride', a linen draper who has many ludicrous adventures on horseback C-502, 503

Gilsonite, a variety of asphalt A-424

Gimbal (*jim'bal*), in compass mountings C-428

Gimlet (*jim'lĕt*) **tower**, or **great screw** (*Turritella terebra*), mollusk shell, *color picture* S-140

Gin, a liquor A-146

Gin, cotton. *See in Index* Cotton gin

Ginger, a spice G-109, *picture* S-341

Gingerbread tree. *See in Index* Doum palm

Ginger family, or **Zingiberaceae** (*zin-jī-bĕr-ā'sē-ē*), a family of plants including the ginger, shelliflower, spiral flag, curcuma, cardamon, and the ginger lily.

Gingham, a cotton fabric usually woven in checks, plaids, or stripes.

Ginkgo (*gingk'gō*) **family**, or **Ginkgoaceae** (*gingk-gō-ā'sē-ē*), a family of trees, consisting of one genus, native to e. Asia, comprising the ginkgo tree: G-109, T-184, 185

Ginnungagap (*gĭ'nŏng'ə găp'*) in Norse myth, the abyss M 476*c*
Ginseng (*jĭn'sĕng*) a plant G 109–10 *picture* G 109
Ginseng family or **Araliaceae** (*ə rā'lĭ ā'sē ē*) a family of plants shrubs and trees found throughout the world including the English ivy *ginseng sarsaparilla* and Hercules club
Ginzberg Asher *See in Index* Ahad Ha'am
Gioconda La painting *See in Index* Mona Lisa
Giolitti (*jō lĭt'tē*) **Giovanni** (1842–1928) Italian statesman several times premier opposed Italy's participation in World War I
Giono (*jō nō'*) **Jean** (born 1895) French novelist born Provence known for stories of peasant life (Harvest "The Song of the World" The Horseman on the Roof)
Giordano (*jôr-dä'nō*) **Luca** (1632–1705) Italian painter born Naples painted with astonishing speed called 'Fa Presto' (Christ Expelling the Traders Francis Xavier' Judgment of Paris)
Giordano Umberto (1867–1948) Italian composer, pupil of Verdi (Andrea Chénier' Fedora Madame Sans Gêne other operas)
Giorgione (*jôr jō'nā*) *or* ***Giorgio Barbarelli*** (1478–1510) Italian painter G 110
'Adoration of the Shepherds *picture* G 110
Giotto (*jŏt'tō*) **di Bondone** (1266?–1337) Italian painter sculptor and architect G 110–11 P 25
'Descent from the Cross' P 25–25*a color picture* P 25
frescoes at Padua G 110 P 25–25*a picture* C 293 *color picture* P 25
portrait of Dante D 14*a* G 111
tower in Florence I 279 G 111 *pictures* G 111, F 147
Giovanni Don *See in Index* Don Juan
Giovanni (*jō vän'nē*) **de Medici** (died 1429) Florentine merchant founded greatness of the Medici family M 163
Giovanni Pisano *See in Index* Pisano Giovanni
Giovinezza (*jō-vē-nĕt'sä*) Fascist hymn N 41
Gipsy *See in Index* Gypsy
Giraffe G 111–12 *pictures* G 112 *Z 360 color picture* A 36
ancestry F 244
foot, *picture* F 225
price paid by zoos Z 358
Giralda (*hē-räl'dä*) a bell tower in Seville Spain S 109 *picture* S 109
Girard (*zhē rär'*) **Jean Baptiste** (Le Père Girard) (1765–1850) Swiss educator entered Franciscan Order held that study should serve to stimulate the ability to think
Girard (*jĭ rärd'*) **Stephen** (1750–1831) American merchant banker and philanthropist P 140 P 190
Girard Ohio city 5 mi nw of Youngstown on Mahoning River pop 10 113 steel milling leather goods *map* O 356
Girard College in Philadelphia Pa for orphan boys gives primary grammar and high school education preparing for college business and industry established 1848 by will of Stephen Girard will stipulated no one officially connected with a church should even visit school so that freedom of religious thought might be assured P 190
Girardon (*zhē rär dôn'*) **François** (1628–1715) French sculptor born Troyes France notable sculptures include Cardinal Richelieu's tomb at the Sorbonne and equestrian statue of Louis XIV at Paris S 781
Girasol (*jĭr'ə sôl*) a variety of opal with red play of color J 349
Giraud (*zhē rō'*) **Henri Honoré** (1879–1949) French general noted for military successes and escapes from German prisons in World Wars I and II *organized Fighting French* forces in Algeria Nov 1942 made high commissioner of French Africa Dec 1942 cochairman with De Gaulle of French Committee of National Liberation June–Nov 1944 commander in chief of French army Aug 1943–April 1944
Giraudoux (*zhē-rō dōō'*) **Jean** (1882–1944) French writer and diplomat graceful impressionistic original style (Campaigns and Intervals reminiscences of World War I Bella a political novel Siegfried Amphitryon 38 and The Madwoman of Chaillot plays)
Girder *See in Index* Architecture *table* of terms
Girder bridge B 306 *See also in Index* Bridge *table*
Girdle magic of Aphrodite A 273
Girdle of Venus long ribbonlike jellyfish of Mediterranean irides cent colors luminescent at night
Girga (*jĭr'gə*) Egypt, town and former capital of Upper Egypt, on Nile 275 mi s of Cairo pop 32 438 Coptic center
Girgenti Sicily *See in Index* Agrigento
Girl Guides British organization from which Girl Scouts developed G 113 F 353 L 337
Princess Elizabeth (now Queen Elizabeth II) *picture* E 334*a*
Girl Reserves in YWCA Y 343
Girls clubs and organizations *See in Index* Youth organizations
Girls Clubs of America Inc founded 1945 national organization which sponsors an after school and early evening program for girls from 6 to 16 years of age
Girl Scouts G 113–16 *pictures* G 113 14
camping *pictures* G 113 114 C 63
flags F 137 *color picture* F 135
Juliette G Low L-337 *picture* L-337
signaling S 179
Girls State a project sponsored by state auxiliaries of the American Legion to give girls of advanced high school age experience in operating the machinery of democratic government Each Girls State aims to pattern its government as nearly as possible after that of its own state the Illini Girls State for example follows the governmental pattern of Illinois Sports and recreation programs teach principles of good sportsmanship Girls States are held annually usually at a college or a university Two girls from each *Girls State* are selected to attend **Girls Nation** held annually in Washington D C, for the study of federal government
Gironde (*zhē rōnd'*) **River** estuary in sw France 45 mi long F 261
Girondists (*jĭ rŏn'dĭsts*) political party of French Revolution advocated moderate republican sm
Madame Roland R 179
oppose Jacobins *J 290*
Girty (*gĕr'tĭ*) **Simon** (1741–1818) American soldier known as the Great Renegade born near Harrisburg Pa deserted Americans for British and Indians in raids to him are attributed innumerable atrocities B 251
Giselle (*jĭ zĕl'*) ballet D 14*h i–l*
Gish Lillian (born 1896) actress born Springfield Ohio in motion pictures in The Birth of a Nation 'The White Sister' on stage in Camille Life with Father Sister **Dorothy Gish** (born 1898) also actress on stage and screen (Nell Gwyn Madame Pompadour) *in 'Uncle Vanya' picture* D 135
Gissing (*gĭs'ĭng*) **George Robert** (1857–1903) English novelist, whose struggles with poverty are reflected in his writings a keen realist (New Grub Street 'The Whirlpool' The Private Papers of Henry Ryecroft partly autobiographical)
Gist (*gĭst*) **Christopher** (1706?–59) scout and soldier born Maryland explored Ohio Valley 1749–52 he is said to have saved George Washington's life while crossing Allegheny River
Gitana (*hē tä'nä* Spanish *hē tä'nə*) name given to dance of gitanos (gypsies) of Spain vivacious emotional and most often improvised to fit the mood of the dancer
Gitche Gumee ('Big Sea Water') Algonquian name for Lake Superior in Longfellow's poem Hiawatha
Gitschin Bohemia *See in Index* Jicin
Giuliano de Medici (*jōō lē'ä nō dā mā'dē-chē*) (1453–78) brother of Lorenzo de Medici M 163
Giuliano de Medici (1479–1516) duke of Nemours 3d son of Lorenzo de Medici
Giulio Romano (*jōō'lyō rō-mä'nō*) (1499?–1546) Italian painter and architect pupil assistant and successor of Raphael as head of Roman school of painting (Dance of Apollo and the Muses)
Giurgevo (*jōōr'jə vō*) or **Giurgiu** (*jōōr'jōō*) Rumania port of Bucharest 35 mi s on Danube pop 30 197 in Russo Turkish wars
"Give me liberty or give me death" (Patrick Henry) H 340
Gizeh (*gē'zĕ*) also **Giza** Egypt town on Nile River nearly opposite Cairo pop 68 570 *map* F 271
great pyramids P 448 *pictures* F 278*a* P 446 S 105
Sphinx S 338–9 *picture* S 338 P 446
Gizzard the more important of a bird's two stomachs in seed eating birds has muscular walls and grinds food *with aid of gravel membranous* sac in carnivorous birds discharges prepared food into intestine for absorption
Gjellerup (*yĕl'ə rup*) **Karl** (1857–1919) Danish poet and novelist early disciple of Georg Brandes wrote The Disciple of the Teutons an antitheological work under his influence later works showed deep spiritual and ethical strain shared Nobel prize 1917 with Pontoppidan (The Mill)
Gjöa (*yō ä*) Amundsen's ship P 350–350*a*
Glace (*glăs*) **Bay** Nova Scotia coal mining center on ne coast of Cape Breton Island 15 mi s of Sydney pop 25 586 fishing *map* C 69 73 early telegraph station C 118
Glacial acetic acid acetic acid free from water which forms icelike crystals at 62° F
Glacial drift G 116
Indiana I 72
Michigan M 220
Minnesota M 277
New York N 206
Ohio O 347–8
Wisconsin W 184
Glacial periods *See in Index* Ice Age
Glacial till G 116 I 4

Glaciation, action of glaciers upon surface over which they travel G-115–16, I-4–7, *maps* I-5–6, *pictures* I-4, 7
Glacier, a moving ice field G-115–16, E-190, *pictures* G-115, C-70, I-4. *See also in Index* Ice Age
Agassiz Louis, work of A-55
Alaska A-131
Alps A-179
Antarctica A-258, 260, *map* A-259
Caucasus Mountains C-155
clay deposits from C-340, I-7
Franz Joseph Glacier, New Zealand, *picture* G-115
glaciation G-115–16, I-4–7, *maps* I-5–6, *pictures* I-4, 7
Glacier Bay National Monument N-35, *maps* A-135, N-18
Glacier National Park G-116, N-35, *color picture* N-26, *map* N-18
Greenland G-213–14, G-115, I-4
icebergs from I-8, *pictures* I-8
lakes formed by E-190, L-87, I-4
Mount Rainier N-37, *picture* I-4
movement G-115–16, F-284
Norway N-300; Jostedalsbrae N-300
soil formation S-227, U-284
Switzerland S-479
Glacier Bay National Monument, s.e. Alaska N-35, *maps* A-135, N-18
Muir discovers M-445
Glacier bear B-86
Glacier National Park, in Montana; 1560 sq. mi. G-116, N-35, *color picture* N-26, *map* N-18
Glacier National Scenic and Recreational Park, in British Columbia, Canada N-38*f*, *maps* N-38*f*, C-80
Glacier Peak, in northern part of Cascade Range, Washington; 10 436 ft Also mountain in n.-central Colorado, height 12 654 ft
Glackens, William J. (1870–1938), impressionist painter born Philadelphia; remarkable colorist, fine sense of form and composition; influenced by Renoir and Manet.
Gladden, Washington (1836–1918), clergyman, social reformer, and author, born Pottsgrove, Pa.; directed attack on "tainted money" and opposed alliance of church with "predatory wealth"; urged personal responsibility of every citizen for good government
Glad'iator, professional fighter in ancient Rome G-116, S-195–6, *picture* G-117
Gladiolus (*glăd-i-ō'lŭs*, formerly *glădĭ'ō-lŭs*), flower G-116, *picture* F-187
Gladkov (*glăd'kŏf*), **Feodor Vasilievich** (born 1883), Russian novelist R-295, 296
Gladstone, William Ewart (1809–98), British statesman G-116, 118, *picture* G-118
anecdote H-282
Disraeli's rivalry with G-118
Irish question G-118, I-230*a*
Joseph Chamberlain and C-182
reforms E-369*d–e*, G-118
U. S. Constitution, quoted on U-345
Victoria's attitude V-470, D-105
Glaire, in bookbinding B-240
Glamorganshire (*glă-môr'găn-shĭr*), southernmost county of Wales; 813 sq. mi.; pop. 1,201,989; cap. Cardiff; great coal beds, iron manufactures; cattle, sheep, hogs.
Gland, animal
packing industry by-product M-155
Gland, in human body G-118. *See also in Index* Hormones
digestive, in stomach D-91*a*, S-401, *diagrams* D-91–91*a*
ductless H-424–6, D-104–5, *diagram* H-425
adrenals H-425, 426, *color picture* P-243, *diagram* H-425
pancreas H-426, *color picture* P-242, *diagram* H-425
pituitary H-424–5, B-280, *diagram* H-425, *pictures* B-281, N-305
thyroid H-425, *color picture* P-241, *diagram* H-425
kidneys K-39
liver L-277
reflex reactions R-89, 90
reproductive H-426, *diagram* H-425
salivary P-244
sebaceous S-193
sweat S-193
Glanders, an infectious disease, common among horses and asses, less frequently attacking cattle and other livestock; ulcers pus discharge from lungs, and high temperature are characteristics.
Glarus (*glă'rŭs*), capital of Swiss canton of same name, 33 mi. s.e. of Zurich pop. 5695; cotton mills, breweries; *map* S-475
Glasgow, Ellen (1874–1945), novelist, born Richmond, Va.; feminist; work shows fine characterization; keen wit, clear forceful language; ('The Romance of a Plain Man'; 'The Wheel of Life', 'The Builders'; 'Barren Ground'; 'The Romantic Comedians'; 'In This Our Life', Pulitzer prize in 1942); A-230*c–f*
Glasgow, Mont., town in n.e. on Milk River 55 mi. s. of Canadian border; pop. 3821; center for shipping cattle, sheep, and grain; Fort Peck Dam nearby; was home of Indian chief Sitting Bull; *map* M-375
Glasgow, largest city of Scotland; pop. 1 089 555, on Clyde River G-118, S-63*a–b*, *map, inset* B-324, *picture* S-63*b*
Glasgow, University of, in Glasgow, Scotland, founded 1450 by Bishop Turnbull, coeducational since 1893; retains many medieval customs, including student election of rector; faculties of arts, sciences, medicine, divinity, law; G-118
James Watt at W-75
Glaspell, Susan (Mrs. Norman H. Matson) (1882–1948), novelist and dramatist, born Davenport, Iowa. With her first husband, George Cram Cook, helped organize Provincetown Players; wrote for them popular plays, 'Suppressed Desires,' and 'Trifles'. Pulitzer prize (1931) for 'Alison's House', play based on life of Emily Dickinson.
Glass, Carter (1858–1946), political leader, born Lynchburg, Va.; member U. S. House of Representatives 1902–18; secretary of the treasury 1918–20; U. S. senator from Virginia after 1920
Federal Reserve Act F-49
Glass, Montague (1877–1934), American humorous author, born Manchester, England ('Potash and Perlmutter' stories dealing with Jewish clothing merchants).
Glass G-119–25, *pictures* G-119–23, 125, *color pictures* G-124
ancient G-123: Egypt G-123, *picture* E-282
architectural G-122*a*, *picture* G-119
blown glass G-122*b–3*, *picture* G-122*b*, *color pictures* G-124, R-145; ancient G-123
building construction, *picture* W-308
buttons B-372
chimney for lamp invented L-89
colonial G-125, *picture* A-216
coloring G-121, C-301, G-134
crown and flint G-122*a*
crystal Q-3
electric insulating properties E-297, 298
electrification explained E-294
engraving and etching, *pictures* G-123, 125
fiber G-122*b*, *pictures* G-119, 122*a*
first American factory G-125
flowers, *color picture* R-145
foam glass G-122*b*
frosted: electric light bulb G-122*b*
gold used for G-134, C-385
grinding and polishing G-122: emery used for E-339; lens L-169; pumice used for L-138
history of glassmaking G-123–5
America G-125: inventions, *table* I-204*b*
jars for canning F-219, G-122*a*
marine life models, *color picture* G-124
materials used S-31, S-38, S-179, Q-3, G-120–1: arsenic A-388–9; feldspar F-50; lead compounds L-141
mirrors M-295
musical instrument, of bowls H-270
natural, obsidian L-138, M-266–7, J-350
oldest definitely dated piece G-123
optical G-122*a*, T-47, L-169
origin G-123
plate glass G-122
quartz Q-3
refractory brick B-304
refracts light L-231
rhinestone glass J-350
ruby G-134, C-385
safety G-122
sand G-120
sheet glass G-121–2, 125, *pictures* G-120–1
speed of light through, *diagram* L-230
spun glass G-122*b*, *pictures* G-119, 122*a*
stained glass windows G-125, *picture* G-125
Stiegel glassware G-125, *picture* A-216
telescope G-122*a*, T-47
ultraviolet lamp Q-3
Venetian G-123, 125
windows first used L-238
Wistar G-125
wool, glass G-122*b*, *pictures* G-122*a*
Glass-bottomed boats, designed for the purpose of viewing marine life
Santa Catalina Island L-316
Glasses, *See in Index* Eyeglasses
Glass flowers, in Harvard University Museum, *color picture* R-145
Glass snake, a legless lizard L-282, 283, *picture* L-284
Glass sponge, *picture* S-353
Glass-Steagall Banking Act, U. S. R-207
Glass wool G-122*b*, *pictures* G-122*a*
Glastonbury (*glăs'ton-bĕr-ĭ*), England, town in Somersetshire, on Brue River, 22 mi. s. of Bristol; pop. 5081; ruins of 12th-century abbey; "Glastonbury thorn," a variety which flowers twice a year, said to have sprung from a specimen planted by Joseph of Arimathea, who built here the first Christian church in England; *map* B-325
Glauber (*glou'bĕr*), **Johann Rudolf** (1604–68), German chemist, discovered (1658) medicinal properties of Glauber's salt.
Glauber's salt, a natural sodium sulfate ($Na_2SO_4.10H_2O$); found in Europe, Utah, Arizona, and California, in mineral springs, and in sea water; used medicinally as cathartic
mineral form M-265
Glaucium (*glą'shĭ-ŭm*), or **horned-poppy**, a genus of annual or perennial plants of the poppy family, native to Eurasia. Several hybrid species were developed by Burbank; foliage blue-white, succulent, flowers yellow, red, or purple; also called sea poppy.
Glau'conite, a mineral containing iron and potassium silicate M-266
sand S-38
Glaucous willow, or **pussy willow** W-142–3

Glaze glassy coating on pottery P 401
Chinese pottery I 394 398a, 400–1, color picture P 396
Della Robbia s P 162 P 396b
enameling E 341–3 *pictures* E 342–3
feldspar used for F 60
molybdenum blinds M 335
tile B 305
underglaze and overglaze P 400–1
Glaze ice I 3
Glazunov (*glä zo nôf'*) Alexander Constantinovitch (1865–1936) Russian composer born St Petersburg (Leningrad) studied under Rimsky Korsakov director Conservatory at Leningrad wrote 8 symphonies concertos ballets marches piano and vocal works
Gleaning gathering of grain left in fields by reapers
story of Ruth P 299
Gleemen and gleemaidens of Middle Ages D 14a
Gleiwitz (*glī'vits*) or Gliwice (*glē vē tsē*) Poland former German city and mining center in Silesia in Poland since 1945 pop 128 203 metallurgy chemicals glass cement, later *map* I 424
Gleizes (*glēz*) Albert Léon (1881–1953) French artist, born Paris impressionist in early work later (1911) one of first cubists
Glencoe Scotland glen 60 mi nw of Glasgow wild scenery massacre of Macdonalds by royal troops 1692
Glen Cove N Y residential suburb of New York City on n shore of Long Island pop 13 130 *map inset* N 204
Glendale *Ariz city 8 mi nw of* Phoenix pop 8149 agricultural marketing Luke Air Force Base nearby *map* A 353
Glendale Calif residential and industrial suburb 7 mi n of Los Angeles pop 95 702 C 126 *maps* L 252 *inset* C 35
Glendive Mont city about 700 mi ne of Billings on Yellowstone River pop 5254 Dawson County Junior College *map* M 375
Williston oil basin *map* N 286
Glendower (*glen dou'er*) Owen (1359?–1415?) Welsh chief national hero last independent prince of Wales and leader of last war for Welsh independence W 3
Glenn Hugh (1788–1833) American trader and merchant purveyor of supplies to frontier posts in Ohio Valley led hunting and trading expedition (1821) from mouth of Verdigris River to Santa Fe
Glennon John Joseph Cardinal (1862–1946) Roman Catholic prelate born Ireland in U S after 1884 archbishop of St Louis after 1903 died in Dublin Ireland on way home after being created cardinal
Glens Falls N Y manufacturing city 47 mi n of Albany *on Hudson River* pop 15 610 shirts and collars paper cement limestone quarries nearby falls and famous cave described in Cooper s The Last of the Mohicans *map* N 205
Glenville State College at Glenville W Va state control founded 1872 *arts and sciences education*
Glenwood Springs Colo resort city and ranching center 60 mi nw of Leadville pop 2412 *map* C 408
Glick *George Washington* (1827–1911) statesman born Greencastle Ohio responsible for revised laws of Kansas (1868) made governor of Kansas 1882 *See also Index* Statuary Hall (Kansas) *table*
Gliden Charles Jasper (1857–1927) business man born Lowell Mass pioneer in development of telephone automobile airplane installed at Lowell (1879) one of first telephone multiple switchboards
Glidden Joseph Farwell (1813–1906) inventor b Charlestown N H made important improvements in barbed wire resulting in twisted form now used
Glide bomb or glider bomb G 225 226
Glider motorless airplane A 101 107 *pictures A 101 106*
as military war A 107 *picture* A 106
Wright brothers W 309–10
Gliding angle *See in Index* Aviation *table* of terms
Gliere Reinhold (1875–1956) Russian composer who works classical in form but modern in harmony and use of orchestral color wrote symphonies (Ilya Murometz) symphonic poems (Cossacks of Zaporozh) ballets (Red Poppy) also chamber music operas
Glinka (*glĭng'kä*) Michael Ivanovich 1804?–57) Russian composer pioneer of school of national music (A Life for the Czar Russian and Ludmilla operas also songs piano pieces and orchestral music)
Gliwice Poland *See in Index* Gleiwitz
Global *See in Index* Aviation *table of terms*
Globe Ariz county seat about 80 mi n of Tucson pop 6419 38 mi from Roosevelt Dam formerly an important copper mining and cattle center tourist trade *maps* A 353 L 252
Globe representing surface of earth *M 84 91b maps M 85–8 90 91b pictures* M 84–5 89 *table* M 91a
ecliptic line *Latham* A 439 *See also Index* Ecliptic
finding direction on D 96–7
time clock *picture* W 58
Globe amaranth an annual plant (*Gomphrena globosa*) of the amaranth *family native to tropics* Leaves soft hairy flowers clover like purple orange white or variegated used as everlastings sometimes called bachelor s button
Globe artichoke A 394
Globefish oceanic fish with power of inflation when attacked becomes like a *football with tail and beak* attached species found on east U S coast (*Spheroides maculatus*) called swellidoodle puffer eggfish closely related to the porcupine fishes which have the same power of inflation
Globeflower *See in Index* Trollius
Globe Theater old playhouse *in London* S 120 124 *pictures* S 123 125
Globe thistle a genus (*Echinops*) of perennial plants of the composite family tall erect leaves toothed spiny at edges often hairy on underside flower heads steel blue or white T 120
Globin in blood d B *208*
Globulins in blood plasma B 209
Glockenspiel (*glŏk'ĕn spēl*) a set of tuned steel bars or tubes played with hammers sometimes called carillon O 405, *picture* M 471
Glomma River Norway largest in Scandinavia rises in Dovre Fjeld tableland *flows 350 mi* into Skagerrak 50 mi se of Oslo *maps* N 301 E 424
Gloriana (*glō ri ā'na*) in Spenser s Faerie *Queene the queen of* Fairyland personified glory and represented Elizabeth I as queen
Glorious City Baghdad B 16 17
Glorious Revolution of 1688 in English history overthrew James II J 293
Glory pea *See in Index* Chanthus
Glossy ibis I 3
Glost firing in pottery making P 400
Glottis an opening between the vocal cords P 244
Gloucester (*glŏs'ter*) Humphrey duke of (1391–1447) youngest son of Henry IV protector of throne during youth of Henry VI charged with treason at time of death I 182
Gloucester or Gloucestershire county in sw England at head of Severn estuary 1257 sq mi pop 938 618 dairying woolen mills cap Gloucester *maps* E 347 B 325
Gloucester English city on Severn River 114 mi nw of London pop 67 268 capital of Gloucestershire originally a Roman camp Norman Gothic cathedral varied industries *map* B 325
18th Imperial *picture* P 352
Sunday school S 453
Gloucester Mass fishing port on Cape Ann 27 mi ne of Boston pop 25 167 summer resort artists colony F 111 *color picture* U 260
map M 133
fisherman memorial *picture* M 135
Kipling immortalizes fishing fleet K 50
Gloucester City N J city on Delaware River opposite Philadelphia pop 14 357 paper textiles lumber *map* N 165
Gloucestershire county in England *See in Index* Gloucester
Glover George W (died 1843) first husband of Mary Baker Eddy E 232
Glover John (1732–97) American Revolutionary War soldier rose from cobbler to brigadier general in charge of retreat from Long Island fleet of boats in which Washington crossed Delaware member of court which tried Major André
Gloversville N Y in e central part of state 40 mi nw of Albany pop 23 614 tanneries textile mills woodenware factories *map* N 205
glove industry G 126
Gloves G 126
earliest in history A 300
manufacturing centers G 126
rubber R 240–1
Glove sponge S 354
Glow lamp
action explained E 318
sodium vapor lamps S 226
Glowworms and fireflies *See in Index* Fireflies and glowworms
Gloxinia a perennial plant of tropical America of the family *Gesneriaceae* large bell shaped flowers of velvety red purple white or intermediate shades garden plant known as gloxinia is of genus *Sinningia*
Gluck (*glŭk*) Alma (1886–1938) American dramatic soprano born Rumania attained operatic and concert success with ut European training became wife of Efrem Zimbalist
Gluck Christoph Willibald (1714–87) German composer G 126–7 O 388 *picture* C 127
Glucose (*glū'kōs*) also called dextrose and grape sugar a simple (monosaccharide) sugar ($C_6H_{12}O_6$) three fourths as sweet as cane sugar commercially term means corn syrup containing both glucose and fructose G 127 S 446 447
candymaking C 111 112
fermentation of Y 337
molecular formula O 424c, *diagram* O 424c
plant chemistry P 293 294
polariscope test L 235
Glucoside a chemical found in plants L-154 C 533
Glue G 127
calcimine contains P 41
colloidal nature C 384

potassium bichromate used C-301
Gluten (*glo͞o'tĕn*), a tough, elastic albuminous protein
barley lacks B-56
bread B-295
corn C-484, *diagram* C-483
macaroni content M-1
wheat flour content F-166, W-115
Glutton, species of wolverine W-182
Glycerin, or **glycerol** G-127, O-424*b*, *c*
base of nitroglycerin D-166
corn product, *diagram* C-483
formula, *diagram* O-424*b*
soapmaking S-211, 213
Glyceryl rosinate, a resin P-41
Glycine, an amino acid O-424*c*
Glycogen (*glī'kō-jĕn*), animal starch G-127, L-277, B-146
muscle fuel B-146, R-118
Glycols, generic name applied to dihydric alcohols G-127
Glyptodont (Greek, "fluted tooth"), extinct armadillolike animal of South America; about size of ox; strong legs, short broad feet, and deeply grooved teeth· *picture* M-61
G-men U-362, F-48
Gnat (*năt*), name generally applied to any very small two-winged insect; also part of common name as in eye gnat and turkey gnat *See also in Index* Buffalo gnat, Fungus gnat
Gnatcatcher, a bird K-46
Gneiss (*nīs*) laminated granitelike rock M-266, G-57, R-169, *pictures* G-50, R-168
Gnetales (*nē-tā'lēz*), order of gymnosperms T-185
Gnomes, or **kobolds** F-11
cobalt named for C-372
Scandinavian Tomte C-294*a*
Gnomonic (*nō-mŏn'ĭk*) **map projection** M-87, 88
navigation N-76
Gnosticism (*nŏs'tĭ-sĭz-m*), movement in Christian church of 2d and 3d centuries; combined elements of Christian Jewish, Greek, and Oriental philosophies; held knowledge obtained from revelation, not faith, is key to salvation.
Gnu (*nu*), or **wildebeest** (*wĭl'dē-bēst* or *vĭl'dē-bēst*), a member of the antelope family; found in Africa; both male and female have curved horns; head and neck resemble buffalo; has stiff mane and long, coarse tail; average height about 4½ ft.; sometimes called "horned horse"; *picture* A-263
'Ape Riding a Gnu,' by Barye, *picture* S-79
"Go, tell the Spartans" P-159
Goa (*gō'ă*), largest of the possessions comprising Portuguese India; on w. coast of India about 250 mi. s. of Bombay; over 1300 sq. mi.; pop. 547,703; conquered by Albuquerque in 1510; contains Panjim (New Goa), capital of Portuguese India; *maps* A-407, I-54
Go about. *See in Index* Nautical terms, *table*
Goat G-128–9, *pictures* G-128
altitude range of Persian wild goat, *picture* Z-362
Cashmere goat G-129, *picture* C-356
ibex I-1–2, *pictures* I-1
leather L-150, G-126
milk M-253, G-128–9
ruminant R-254
sheep related to G-128, S-136
Goat. *See in Index* Capricornus
Goat, Rocky Mountain, an antelope A-262, *color picture* N-259
Goat antelopes. *See in Index* Mountain goats
Goatfish, or **surmullets**, family of moderate-sized shore fish (*Mullidae*), with flat, oblong body, large scales, and a pair of chin barbels for digging worms; inhabits warm seas; superior food fish; color, gold or red.
Goat Island, in Niagara River N-230, *picture-map* N-231
Goat milk M-253, G-128–9
Goatsbeard, a biennial plant (*Tragopogon pratensis*) of composite family, native to Europe but common wildflower in North America. Belongs to same genus as the vegetable salsify. Grows to 3 ft ; leaves gray-green grasslike. Flower heads pale yellow 2½ in. across; seeds form a round feathery mass, similar to dandelion, sometimes called meadow salsify.
Goatskin L-150
parchment B-232
Goatsucker, family of birds (*Caprimulgidae*), includes nighthawk and whippoorwill.
Gob, slang term for an American sailor; originated in World War I
Gobelin (*gŏb-lan'*) **tapestries**, famous French tapestries made in Paris, so named from a family of dyers by name of Gobelin who owned building in which tapestry industry was established in 16th century, industry now maintained by French government T-14
Gobi (*gō'bē*) **The**, desert region in central China, 500 000 sq mi., elevation 3000 to 5000 ft M-342–3, *maps* C-259, A-406, 411, M-343, D-73*a*
exploration E-454
Goblet cells, in stomach, *diagram* D-91*a*
Goblins, in folklore, grotesque fairies similar to gnomes and kobolds; they are sometimes evil and malicious and sometimes only playful and tricky.
Goby, any of numerous, widely distributed, spiny-finned fishes constituting family *Gobiidae*, having wide, flat head, large mouth, and ventral fins often united in funnel-shaped disk; small and usually marine; some species very small estivation F-107
mudskipper, or skipping goby M-444, 445, F-102, *picture* F-102
Philippine goby F-100
Godard (*gō-dăr'*), **Benjamin Louis Paul** (1849–95), French composer; works for orchestra, violin, piano, songs, chamber music, operas ('Jocelyn').
Godavari (*gō-dăv'ă-rē*), large river in s. India; rises n.e. of Bombay in Western Ghats, flows 900 mi. s.e., entering Bay of Bengal by 7 mouths; navigable for 300 mi.: I-53, *maps* I-54, A-407
Goddard, Henry Herbert (born 1866), American psychologist, born Vassalboro, Me.; authority on feeblemindedness; researcher, lecturer, writer; most widely known study 'Kallikak Family'; professor of abnormal and clinical psychology, Ohio State University, 1922–38, emeritus after 1938.
Goddard, Robert Hutchings (1882–1945), physicist, born Worcester, Mass.; physics professor Clark University after 1919; noted for research in rocket propulsion, especially in rocket method for reaching great heights: S-309*a*
Godden, Rumer (Mrs. James Haynes Dixon) (born 1907), English author, playwright, poet, born Sussex, England; educated abroad and in England; lived in India, then returned to England. Her books for adults include the novels 'Black Narcissus', 'The River', and 'Kingfishers Catch Fire'. For children, 'The Dolls' House' and 'The Mousewife'. She is also the author of the poem, 'In Noah's Ark'.
Godetia, a genus of ornamental herbs of the evening primrose family; chiefly hardy low-growing annuals (*Godetia grandiflora*); has numerous pink or crimson flowers.
Go-devil, pipeline cleaner P-178
Godey, Louis Antoine (1804–78), American publisher of first woman's periodical in U. S., *Godey's Lady's Book*, Philadelphia (1830–77).
Godfrey, Arthur (born 1903), radio and television entertainer, born New York City; served in Navy, Coast Guard, and Naval Reserve; graduated from Naval Radio School, Great Lakes Ill., 1921; popular in radio and television.
Godfrey, Thomas (1704–49), mathematician and astronomer, born Philadelphia, Pa. P-140
Godfrey of Bouillon (*bo-yôn'*) (1060?–1100), leader in First Crusade, and first Christian ruler of Jerusalem; hero of Tasso's 'Jerusalem Delivered'; C-519, 520, *picture* M-238*d*
Godhavn (*gŏd'hăv-n*), settlement in w Greenland; pop 319; *map* N-250
Godiva (*gŏ-dī'va*), **Lady** (11th century), English heroine C-502
Godkin, Edwin Lawrence (1831–1902), American journalist and author, born in Ireland; editor of *New York Evening Post* and *The Nation*; opposed political corruption.
Godless, Society of the Militant, Russian Communist organization R-272
Godman, John D. (1794–1830), physician, anatomist, and naturalist, born Annapolis, Md.; taught anatomy, physiology, and surgery; one of first in America to prove that ether vapor had anesthetic power ('Anatomical Investigations'; 'American Natural History'; 'Rambles of a Naturalist').
Godolphin Arabian, horse, foundation sire of Thoroughbred Horse H-428*d*, *table* H-428*c*
Godowsky (*gŏ-dôv'skĭ*), **Leopold** (1870–1938), Russian-American pianist and composer, born Vilnius (Wilno), Lithuania; studied under Saint-Saëns; extensive concert tours; director piano department Chicago Conservatory, 1890–1900; director Master Piano School of Imperial Academy, Vienna, 1902–12; in U. S. after 1912; paraphrases of Bach, Chopin, Johann Strauss; many original compositions
Godoy (*gō-doi'*), **Manuel de** (1767–1851), Spanish duke of Alcudia and prince of the Peace, favorite of Charles IV and his queen; dominated Spain during the king's reign.
Gods and goddesses, in mythology, *Reference-Outline* M-478–9
'God Save the King', or **'God Save the Queen'**, British national song N-40
Godthaab (*gŏt'hŏp*), capital of Greenland; on s.w. coast; pop. 1021; *map* N-250
Godunov, Boris. *See in Index* Boris Godunov
God'win, Mary Wollstonecraft (1759–97), English women's rights advocate; wife of William Godwin; mother of Shelley's wife, Mary
'A Vindication of the Rights of Women' W-184, E-379
Godwin, Parke (1816–1904), journalist, essayist, and editor, born Paterson, N. J., for years with *New York Evening Post*; compiled two biographical encyclopedias; wrote 'Out of the Past'; 'Vala'; 'Political Essays'.
Godwin, William (1756–1836), English political writer, novelist; radi-

cal believer in freedom power of reason (Inquiry concerning Political Justice) married Mary Wollstonecraft 1797 inspired young writers notably Bulwer Lytton and Shelley who married Godwin's daughter Mary many financial difficulties (novels St Leon Adventures of Caleb Williams) F 379

Godwin Austen Mount also called K 2 Karakorumor and Dapsang peak in Karakoram Range of n Kashmir probably exceeded in height only by Mt Everest altitude *28 250 ft named for* Engl sh geologist Henry Haversham Godwin Austen (1834 19 3) first climbed by Italian expedition led by Ard to Desio summit reached on July 31 1954

height comparative See in Index Mountains *table*

Godwine earl of Wessex (died *1053*) most powerful man in Britain of his day favorite of Canute helped raise Edward the Confessor to Engl sh *throne*

Godwit shore bird of family *Scolopacidae* the marbled godwit (*Limosa fedoa*) is about 18 inches *long ranges from* s Alberta s Manitoba, and South Dakota to Ecuador and Peru another species is the Hudsonian godwit (*Limosa haemastica*) it grows to be 15 inches long ranges from Arctic regions of North America to Chile Argentina Patagonia and the Falkland Islands S 209

Goebbels (*gŭb bels*) **Paul Joseph** (1897 1945) German Nazi leader minister of propaganda after 1933 committed suicide G 99 H 385

Goeduck or **gwedus** (*gwē d k*) a *clam* C 339

Goering (*gŭr'ing*) **Hermann Wilhelm** (1893 1946) German Nazi leader premier of Prussia minister of aviation president of Reichstag chief of secret police field marshal n ar shal of the Reich sentenced to death for war crimes Sept 1946 committed suicide Oct H 385 *G 93 pictures H 384 W 299a*

Goering Reinhard (1887–1936) German playwright noted for two pacifist dramas Sea Battle and Scapa Flow D 134

Goes (*kōs*) **Hugo van der** (1440? 82) Dutch painter of early Netherland school most important work Portinari *altarpiece now in the* Uffizi Gallery Florence

Goethals (*gō thl*) **George Washington** (1858–1928) U S Army officer and engineer of Panama Canal G 129 P 58 *picture* G 109

Goethe (*gu tĕ*) **Johann Wolfgang von** (1749 1832) German poet G 129–30 *G 84 pictures G 130 G 83* birthplace F 279 Faust F 46 G 130 H 280 P 440 quoted on Shakespeare S 127

Goffe (*gŏf*) **William** (1605? 79?) military officer under Cromwell one of judges who signed death warrant of Charles I of England later fled to America and lived in New Haven Conn and Hadley Mass

Gog and Magog in Bible names of a king and his land (*Ezek xxxviii–xxxix*) also of leaders in last battle against Christ's followers (Rev xx) also names of two huge wooden statues in London Guildhall which *were destroyed* by bombs in World War II but were replaced in 1953 by new figures more than 9 ft high

Gogebic (*go gē bik*) **Range** an iron region in Gogebic County in upper peninsula of Michigan extends into Wisconsin

Gogh (*gŏk*) **Vincent van** (1853 90) Dutch artist G 130–1 P 32 34 *pictures* G 131

Bedroom at Arles P 34 *color picture* P 34a

self portrait *picture* G 131

Gogol (*gŏ gŏl*) **Nikolai Vasilievich** (1809–52) Russian *novelist and* dramatist called father of modern Russian realism R 294 *picture* R 294

Goiás or **Goyaz** (*goi ás*) state in interior Brazil chiefly forested highlands *254 901 sq mi pop* 1 734 740 B 292

Goiás or **Goyaz** (*elt*) *in state of* Goiás in central Brazil pop 58°9 altitude 1600 ft *map* B °88

Goiter (*ter*) an enlargement of the thyroid gland H 425 F 118 *diet fish F 111* iodized salt in *I 294a*

Golconda (*gŏl kŏn da* Indian *gōl kōn d't*) India ruined city 5 m w of city of Hyderabad diamond cutting center in 16th century name hence used to mean a rich mine

Gold a metallic chemical element G 131 4 *pictures* G 131–4 *tables* M 176 P 151 C 211 214 *See also in Index* Gold rush Gold standard and topics beginning with Gold

alchemists seek to make A 145, C 221 *picture* C 221

alloys of 132 3

antiseptics from A 266

carats and fineness G 133

colloidal suspension C 385

crystal *picture* C 625

currency M 335–40 *picture* M 340, *table* M 339

depository U S Fort Knox Ky *picture* K 20

dissolved by aqua regia G 134

ductility G 134

electrical conductivity E 297

electrochemical activity E 315

electroplating F 321

fool's gold or pyrite M 262

green gold *See in Index* Green gold

illumination of books B 236

industrial uses G 133–4

leaf G 133 4

malleability G 133 *picture* G 134

melting point, table M 284

metalwork M 177 Italian salt cellar *picture* M 178 Peruvian *picture* M 179

mining and refining G 132 M 268 270 *pictures* G 131 S C 40 M 269 *color picture* U 298

deepest mine G 132

dredging G 132 *picture* G 133 A 136 D 141 S 174

hydraulic G 132 *picture* G 133

placer G 132

monetary M 335–40 legal standard and value G 133 M 339 reserve in U S M 339

native mineral M 262

pen point use in, picture P 115

producing regions G 132

Australia A 484 M 166–7

Canada British Columbia B 315 Ontario O 382 Yukon Y *346*

Fiji F 66

Philippine Islands P °00

Russia R 277

Saudi Arabia A 288

South Africa G 132 J 357 S 245 *picture* A 44

South America Brazil B 291 G 132

Tanganyika Territory T 198

United States G 132 *U 296* 301 Alaska A 133 137 *picture* A 136 California C 41 Colorado C 401 *422 424* Nevada N 126 Oregon 419 O 420 South Dakota in 1849 O 420 S 296 305

production of present time G 131

prospecting methods M 268 *pictures* G 131 2: passes carry prospectors supplies *picture* H 428*h*

rolled G 134

uses G 133–4

weight G 132

White gold G 132 table A 174

wire and lace G 134 making *pictures* G 134

Gold beating G 133

Goldberger Joseph (*1874–1929*) American public health official and medical research worker born Austria Hungary emigrated to New York City in 1890 surgeon in U S Public Health Service 1912–29 discovers pellagra preventive V 498

Gold certificates paper money M 337–8 *table* M 339

portraits and designs *table* M 339

Gold chloride G 134

Gold Coast a block of country under British government in w Africa extending along Gulf of Guinea area 91 843 sq mi pop 4 905 000 cap Accra G 134*a b map* A 46 *pictures* G 134*a–b*

bronze weights *color picture* S 72

cities G 134*a b*

diamonds D 78

government G 134*a*

location *picture* G 134*a*

minerals G 134*b* diamonds D 78

natural features G 134*a*

people G 134*a* how the people live *pictures* G 134*b*

policeman *picture* P 358

relationships in continent, *maps* A 48–7 41 2 39 51

shelter G 134*a–b*

Gold Coast Colony British colony part of Gold Coast country in w Africa cap Cape Coast 23 937 sq mi pop 2 464 700 G 134*a b map* A 46

speaker of the assembly *picture* A 40

Gold dredging C 132 *pictures* G 133 D 141 A 136 S 174

Gold dust a spring flowering perennial (*Alyssum saxatile*) of the mustard family native to Europe Low growing grayish leaves flowers golden yellow in clusters used in rock gardens also called golden tuft basket of gold rock madwort

Gold employees in Panama P 56

Golden Colo city 14 mi w of Denver pop 5338 brewery pottery works Colorado School of Mines *map* C 409

Golden Age

Athens P 149–50 G 199–200

France F 287 8

Italian literature I 260

Latin literature L 130

Netherlands N 121

Roman Empire M 94

Saturn S 49

Spain and Spanish literature S 328

Golden apples in mythology

Atalanta and A 446

awarded by Paris and Aphrodite T 190

of Hesperides H 343

Golden Ass (Latin *De Asino Aureo*) satirical romance by Lucius Apuleius concerns the adventures of one *Lucius who is transformed into an* ass thus disguised he observes the preposterous behavior of mankind until enlightened by his experiences he emerges a new man story includes the well known fairy tale Cupid and Psyche

Golden aster A 426

Golden bell *See in Index* Forsythia

Golden Bough The *See in Index* Frazer Sir James George

Golden Bull originally any charter with golden seal or bulla especially edict issued 1356 by Emperor Charles IV G 97

Golden calf image made by Israelites from their earrings at instigation of Aaron when Moses was absent on Mt Sinai receiving the Ten Commandments (Exod xxxii) M 339

Goldenchain, a tree. *See in Index* Laburnum
Golden Circle, Knights of the C-337
Golden-crowned kinglet K-46
Golden digger, a solitary wasp (*Ammophila ichneumonea*); stores grasshoppers in underground nest to feed its larvae: W-52, *color picture* W-51
Golden eagle E-167–8
speed in flight B-156
Golden eardrops. *See in Index* Dicentra
Goldeneye, or whistler, a diving duck; two species, the Barrows (*Glaucionetta islandica*) and the American (*Glaucionetta clangula*): D-160, *picture* D-160
nest D-158
Golden Fleece, sought by the Argonauts A-338
Golden Fleece, Order of the, order of knighthood in Austria and Spain; membership limited to 24 knights exclusive of sovereign; independent branches in Austria and Spain after 1700; Austrian order discontinued 1919, Spanish 1931: A-338
Golden Gate, channel about 2 mi. wide, entrance to San Francisco Bay S-41, *maps* C-26, *inset* C-34, *picture* S-41
bridge B-308, *pictures* B-310, S-41. *See also in Index* Bridge *table*
Golden Gate International Exposition, at San Francisco (1939–40) S-41*a*, *pictures* F-11
Golden Gate Park, San Francisco S-41*a*
Golden Gloves Tournament B-270, *pictures* B-268–9
Golden glow, a perennial plant of the genus *Rudbeckia* of the composite family with showy yellow or orange flower heads; also called coneflower.
Golden ground beetles, *picture* B-105
Golden Hill, battle of, in New York N-214
'Golden Hind', Drake's ship D-128
Golden Horde. Tatars who overran Russia in 13th century M-345
effect on Russian literature R-294
Golden Horn, harbor of Istanbul I-258, *map* I-258, *picture* I-259
Golden Horn, harbor of Vladivostok, Siberia V-499
Golden-leaved chinquapin, or **giant chinquapin** C-287
Golden Legend, The, ecclesiastical work of 13th century by Jacobus de Voragine in 177 sections descriptive of saints' days in Roman calendar.
Golden mean, in philosophy G-202
Golden Militia, or **Golden Spur, Order of.** *See in Index* Order of Golden Militia
Golden moss. *See in Index* Stonecrop
Golden plover P-321
migration M-242, *map* M-241
Golden retriever, dog, *color picture* D-112, *table* D-118
Goldenrod G-135, *picture* F-181, *color pictures* F-176, S-384*a*
Golden Rose, a papal honor D-43
Golden Rule, saying of Jesus: "Therefore all things whatsoever ye would that men should do to you, do ye even so to them: for this is the law and the prophets" (Matt. vii, 12). Similarly stated Luke vi, 31.
Goldenseal, or **orangeroot**, a low perennial herb (*Hydrastis canadensis*) of the crowfoot family, with thick, yellow rootstock and hairy stem terminated by a single greenish-white flower; used in medicine.
Golden State, popular name for California C-25
Golden Triangle, section of Pittsburgh, Pa. P-274
Golden trout T-193
Golden wattle, an acacia tree in Australia
flower, *picture* A-475
Golden-winged woodpecker. *See in Index* Woodpecker
Goldfield, Nev., mining town; had great boom in early 20th century: N-126, *maps* N-133, U-252
Goldfinch (popular name **wild canary**) G-135, *pictures* F-68, *color pictures* B-184, N-44
eggs G-135, *color picture* E-268*a*
nest G-175, B-172
state bird, *table* B-158
Goldfish G-135
pets, care of G-135, P-185
shubunkin, *picture* P-183
Goldie, John (1793–1886), Canadian botanist, born Ayrshire, Scotland; settled in Canada 1844; a fern which he identified, *Aspidium goldianum*, was named after him
Golding, Louis (born 1895), English writer, born Manchester; inveterate traveler ('Sorrows of War', 'Prophet and Fool', verse; 'Sunward' 'Sicilian Noon', 'Those Ancient Lands', travel books; 'Day of Atonement' 'Magnolia Street', 'Mr Emmanuel', novels; 'The World I Knew' reminiscences).
Gold lace G-134
Gold leaf G-133–4
making, *picture* G-134
Gold leaf electroscope. *See in Index* Electroscope
Goldman, Edwin Franko (born 1878), conductor and composer, born Louisville Ky. organized Goldman band, New York City, 1918: B-46*c*
Goldman, Emma (1869–1940), American anarchist, born Russia; co-publisher of *Mother Earth*, anarchist monthly; deported from United States to Russia, 1919; left Russia about 1921; died in Toronto, Canada and buried at her request, in Chicago, Ill., beside comrade anarchists of Haymarket Riot of 1886 ('Living My Life').
Goldmark, Karl (1830–1915), Austrian composer, born Hungary ('Sakuntala', 'Penthesilea', 'In Springtime', compositions for orchestra; 'Queen of Sheba', 'Cricket on the Hearth', operas).
Goldmark, Peter Carl (born 1906), American engineer, born Budapest; chief television engineer Columbia Broadcasting System 1936–44; director engineering research and development, from 1944; invented a method of color television (demonstrated 1940).
Goldmark, Rubin (1872–1936), composer and teacher of music, born New York City, nephew of Karl Goldmark ('Samson', symphonic poem; 'Hiawatha', 'A Negro Rhapsody', overtures).
Goldoni (*gōl-dō'nē*), **Carlo** (1707–93), Italian dramatist, founder of modern Italian comedy; 'The Coffee House' and 'Pamela' are his best; also wrote plays in French.
Gold point, in economics F-235
Gold rush
Alaska and Klondike A-137, Y-348
British Columbia B-316–17
California S-2, C-47–8, D-26, *pictures* C-47, G-132
Colorado C-401, 414, D-73
Idaho I-23
Nevada N-126
Goldsboro, N.C., commercial center in fruit, grain, and cotton region on Neuse River, 48 mi. s.e. of Raleigh; pop. 21,454; cotton yarn, cottonseed and soybean products, furniture, brick; *map* N-275
Goldschmidt (*gōlt'shmit*), **Hans** (1861–1923), German chemist, born Berlin; developed aluminothermic, or Goldschmidt's, process, in which powdered aluminum is ignited to reduce various metallic oxides; Goldschmidt's process applied also to thermite welding.
Goldschmidt, Jenny Lind. *See in Index* Lind, Jenny
Gold Seal Award, in children's literature L-267
Goldsmith, Oliver (1728–74), English novelist, essayist, and poet G-135, E-378*b*, *picture* G-135
children's books L-269–70
puppet story P-440
Samuel Johnson and, *picture* C-459
Goldsmith beetle, large yellow nocturnal beetle (*Cotalpa lanigera*) similar to common dung beetle; common in e. U. S.; fond of willow trees; name also applied to other species of the subfamily *Rutelinae*.
Goldsmithing. *See also in Index* Metalwork
Byzantine reredos, St. Mark's B-374
Gold standard, use of gold alone for monetary standard, as opposed to use of gold and silver or of irredeemable paper M-339
adopted in U. S. (1900) M-19
bimetallism M-338
Bryan opposes M-18, B-334
foreign exchange F-235
franc stabilized F-270
gold bullion standard M-339
managed currency R-206, 207, M-339
monetary gold reserve in U.S. M-339
monometallism M-339
Populist attitude M-17
Sherman Silver Purchase Act H-275
silver demonetized in U. S. G-153
"Specie Circular" (1836) J-287
supported by: Cleveland C-345; Hayes H-298
suspended in U.S. R-207
Gold Star, U. S. Navy D-38
Gold Star Mothers. *See in Index* American Gold Star Mothers
Gold Star Mother's Day F-58
Gold Star Wives of America, Inc., a patriotic organization of wives whose husbands were killed in World War II and the Korean conflict; founded 1945; headquarters, Washington, D. C.
Goldstein, Eugene (1850–1930), German physicist, professor at University of Berlin; discovered "canal rays" or positive rays.
Goldstone, or **aventurine**, a semiprecious stone J-349
Goldthread, a low perennial herb (*Coptis trifolia*) of the crowfoot family having evergreen leaves and small white or yellow flowers; a tonic medicine is extracted from its bitter root, also a yellow dye.
Golf G-136–8, *pictures* G-136–8
bibliography H-390–1
Golf's Hall of Fame G-138
Golgotha (*gōl'gō-thą*), or **Calvary**, place where Jesus was crucified J-336, J-340
Goliad, Tex., city and county seat of Goliad County; 134 miles s.e. of Austin; pop. 1584; over 300 Americans massacred by Mexicans, March 27, 1836; 18th-century mission and presidio: *map* T-91
Goliath, Philistine giant (I Samuel xvii) D-21
Goliath beetle, a large beetle of the family *Scarabeidae* B-104
Gollancz (*gōl'ăns*), **Sir Hermann** (1852–1930), English rabbi, educator, Biblical scholar, and social worker; professor of Hebrew, University College, London, 1902–23; author of many books and of translations from Hebrew and Aramaic.
Gollancz, Sir Israel (1864–1930), British scholar; brother of Sir Hermann; professor of English litera-

ture King's College University of London editor and translator of many Old and Middle English texts and authority on Shakespeare

Golschmann Vladimir (born 1893) Franco American musical conductor born Paris founded Golschmann Orchestra Paris became conductor St Louis Symphony Orchestra 1934

Goltz Colmar baron von der (1843–1916) Prussian field marshal and military writer reorganized Turkish army 1883–95 governor general of Belgium 1914 commanded Turkish army in Mesopotamia 1915 16 (War History of Germany in 19th Century The Nation in Arms)

Gomel Russia manufacturing and railroad center and river port on branch of Dnieper River 350 mi sw of Moscow pop 120 000 *maps* R 267 D 417

Gomes (*gō mas*) **Antonio Carlos** (1839–96) Brazilian composer pupil of Rossi Milan Conservatory director Para Conservatory wrote operas Salvator Rosa and Maria Tudor also choral and piano works

Gómez (*gō mes*) **Esteban or Estevan** (1470? 1530?) Portuguese explorer sailed with Magellan in 1519 but led mutiny on the *San Antonio* and returned to Spain sent by Charles V to seek Northwest Passage A 180

Gómez Juan Vicente (1859–1935) Venezuelan political leader a mountaineer and rancher he came quickly to power under General Cipriano Castro through his fighting ability president for many terms and virtual dictator for over 20 years V 444 442

Gómez y Baez (*ē ba es*) **Maximo** (1831?–1905) Cuban patriot general commander in chief (1895–98) in insurrection against Spain

Gomorrah and Sodom in Biblical geography cities in Palestine destroyed for wickedness A 4
story of Lot's wife A 4

Gompers Samuel (1850–1924) American labor leader G 139 L 71 *picture* C 139
Council of National Defense W 234
memorial *picture* L 70d
political attitude L 71

Gomphrena *See in Index* Globe amaranth

Gonaïves (*gō na ēv*) **Gulf of** on W coast of Haiti H 245

Goncharov (*gun chä-rôf'*) **Ivan Alexandrovitch** (1812–91) Russian novelist wrote Oblomov which gave Russia the term Oblomovism as a synonym for weak will and indolence R 295–6

Goncourt (*gôn kōr'*) **Edmond de** (1822–96) French novelist and historian in collaboration with his brother **Jules** (1830–70) wrote valuable studies of French society novels continued realistic method of Flaubert and influenced Zola (Germinie Lacerteux called the clinic of love Renée Mauperin a story of young Parisian society *Sœur* Madame Gervaisais study of mysticism) F 288 D 82

Goncourt Academie des French literary assembly established by terms of will of Edmond de Goncourt, 1896 for encouragement of independent art among young writers to consist of 10 members annual prize given for best novel historical work, or collection of short stories

Gondar (*gon dar*) religious center and former capital of Ethiopia Africa in the n 250 mi from Red Sea pop 14 000 *maps* E 402 A 48

Gondokoro Egypt village on Upper Nile formerly center of slave and ivory trade

Gondola long narrow Venetian boat *picture* V 445

Gondola car a railroad car *picture* R 69

Gonds an aboriginal people of India who maintained independence until 18th century Central Provinces corresponded roughly to their kingdom I 56

Goneril one of *King Lear's* two cruel daughters in Shakespeare's tragedy K 48

Gong a musical instrument M 47a *picture* M 471
sound waves explained S 237 *diagram* S 237

Góngora y Argote (*gôn gō ra e ar gō tā*) **Luis de** (1561–1627) Spanish poet and priest from comparatively simple ballads and satires he turned to elaborate and obscure poems which gave rise to term Gongorism

Goniometer an instrument for measuring angles

Gonsalvo de Córdoba (*gon sal' ō dā kôr' dō ba*) (**Gonzalo Hernandez y Aguilar**) (1453?–1515) Spanish general whose many conquests made him famous throughout Europe secured possession of Naples to Spain but lost popularity with king toward close of his life

Gonzaga University at Spokane Wash Roman Catholic opened 1889 arts and sciences business administration engineering law music nursing graduate studies

Gonzales (*gôn sā'lās*) **Manuel** (1833–93) Mexican general friend of Diaz whom he aided in revolution of 1876 succeeded Diaz as president 1880–84 when he resigned in his friend's favor brilliant general but poor administrator

Gonzalez (*gôn thā'leth*) **Julio** (1876–1942) Spanish sculptor and painter born Barcelona Spain taught metal techniques to Picasso S 83

Goober a peanut P 104

Good James William (1866 1933) U S secretary of war under President Hoover born Cedar Rapids Iowa congressman from Iowa 1909–23

Good Conduct Medal U S D 38 *picture* D 39

Good Counsel College at White Plains N Y Roman Catholic for women founded 1923 arts and sciences

Goode George Brown (1851 96) naturalist and administrator born New Albany Ind assistant secretary Smithsonian Institution from 1887 (American Fishes Oceanic Ichthyology with T H Bean Principles of Museum Administration)

Good Feeling Era of in U S history M 365

Good Friday E 200

Good Hope Cape of *See in Index* Cape of Good Hope

Goodhue Bertram Grosvenor (1869–1924) architect born Pomfret Hill Conn designed churches cathedrals and chapels in which Gothic was adapted to modern methods of construction (his last and probably greatest being the University of Chicago chapel) used sculpture as integral part of building rather than surface ornament for Nebraska State Capitol conceived design not only impressive but unique among buildings of this type

Good King Robert title given to Robert Bruce of Scotland B 332

Goodman Benny (born 1909) clarinetist orchestra conductor born Chicago Ill remarkable for versatility having won fame both as conductor of popular music and swing concerts and as clarinet soloist with symphony orchestras

Good manners E 404–11 *See also in Index* Etiquette

Good name in man or woman O 427

Good Neighbor Policy of United States toward Latin America P 210–11 L 123–4 M 386

Goodnow Frank J (1859–1939) educator and legal scholar born Brooklyn N Y on faculty at Columbia University 1883 1913 president Johns Hopkins University 1914–29 books include Social Reform and the Constitution and Principles of Constitutional Government

Goodrich Benjamin Franklin (1841–88) physician and industrialist born Ripley N Y
Akron Ohio rubber factory A 111

Goodrich Samuel Griswold (Peter Parley) (1793–1860) American author best known for his school histories and other juvenile works

Goodspeed Edgar Johnson (born 1871) classical Greek and Biblical scholar born Quincy Ill professor at University of Chicago 1898–1937 with J M P Smith translated the Bible into modern English (The Story of the New Testament New Solutions of New Testament Problems How to Read the Bible)

Goodspeed name of one of ships in which first Jamestown colonists sailed to America J 293

Good Templars International Order of, society to promote world wide prohibition of liquor and total abstinence for the individual organized Syracuse N Y 1851 prohibition party and Woman's Christian Temperance Union grew from it

Goodwick Wales *See in Index* Fishguard and Goodwick

Good will the reputation good standing esteem and public confluence in an organization which in the transfer of a business can be sold like any other property

Goodwin Nat C (1857 1919) American actor known for his dry humorous characterizations

Goodwin Sands a range of dangerous shoals off se coast of England at entrance to Straits of Dover scene of many wrecks its shifting sands separated from mainland by the anchorage of Downs

Gooly fish *See in Index* Spot

Goodyear Charles (1800–1860) inventor born New Haven Conn inventor of process of vulcanizing rubber F 242 *picture* I 201
rubber vulcanization patented *table* I 199

Goodyear Charles Jr (1833–96) industrialist born Germantown Pa son of the preceding promoted development of welt shoe machinery S 165

Goodyear Miles (1817–49) pioneer settler in Utah born New Haven Conn worked his way West 1836 to Fort Hall Idaho with Marcus Whitman's party as trapper and fur trader in Snake River region he earned place as one of famed Mountain Men of the West built Fort Buenaventura 1845 on site of present Ogden Utah sold it to Mormons 1847 and moved to California

Goodyear welt in shoes S 164

Goody Two Shoes *See in Index* History of Goody Two Shoes

Goofah boat B 217 *picture* B 218

Googe (*ō g or ūb*) **Barnabe** (1540–94) English poet born Lincolnshire his eclogues among earliest

English pastoral poetry ('Eglogs, Epytaphes, and Sonettes').
Googol. *See in Index* Kasner, Edward
Goosander, a diving duck. *See in Index* Merganser
Goose, Elizabeth, supposed original of Mother Goose M-406
Goose G-139–40, *pictures* G-139–40, E-221
incubation period B-174
length of life, *pictograph* A-249
migration G-140, M-243, *map* M-241
pasturing in Europe P-402b
sacred geese, how they saved Rome R-184
speed in flight B-156
Goose barnacle, or **stalked barnacle** B-56
Goose Bay Airport, in Labrador, Canada L-76
Gooseberry G-140
host of white pine blister rust R-297
Gooseberry, Mr., name for French fur trader Groseilliers F-322–3
Goose flesh, or **goose pimples,** cause of S-193
Goosefoot. *See in Index* Lamb's quarters
Goosefoot family, or **Chenopodiaceae** (*kē-nō-pō-dī-ā'sē-ē*), a family of plants and shrubs including saltbush, orach, quail bush, beet, mangel, wormseed, mock cypress, spinach, winter fat, and Russian thistle.
Goose Lake, on boundary of California and Oregon; about 30 mi. long and 10 mi. wide· *map* C-34
water level, change D-152
Goose step, military step of Germany, *picture* G-99
'Goose with the Golden Eggs, The', fable F-3
Goos'sens, Eugene (born 1893), English musician, born London; opera conductor in England, conductor Rochester, N. Y., Philharmonic Orchestra 1923–31, Cincinnati Symphony Orchestra 1931–47, Sydney, Australia, Symphony Orchestra 1947–; composed 'Judith' and 'Don Juan', operas, also orchestral works.
G.O.P. *See in Index* Grand Old Party
Gopher (*gō'fẽr*), a rodent G-140–1, *picture* G-141
Gopher State, popular name for Minnesota
Gopher tortoise, of s.e. United States (*Gopherus polyphemus*) T-224
Gorbodue (*gôr'bō-dūk*), mythical king of Britain; subject of first English tragedy. *See also in Index* Dorset, Thomas Sackville, earl of
Gordian knot, which Alexander the Great cut, *picture* A-148
Gordium, ancient capital of Phrygia; scene of cutting of Gordian knot: *map* M-7
Gordon, Adam Lindsay (1833–70), one of most popular and distinctive of Australian poets, born Fayal, island of Azores A-493
Gordon, Anna Adams (1853–1931), temperance worker, born Boston, Mass.; secretary to Frances E. Willard 21 years; president International Woman's Christian Temperance Union ('Songs for Young Americans'; 'Life of Frances E. Willard'; 'Toots, and Other Stories', for children).
Gordon, Charles George (1833–85), British army officer (Chinese Gordon) G-141, S-442a, *picture* G-141
Kitchener avenges death K-52
Gordon, Charles W. (1860–1937), Canadian missionary and novelist; pen name Ralph Connor: C-106a
Gordon, Lord George (1751–93), English agitator, born London; headed anti-Catholic movement which resulted in Gordon riots of 1780.
Gordon, George Angier (1853–1929), American Congregational minister, born Scotland; pastor, Old South Church, Boston, 1884–1929; university preacher to Harvard and Yale universities.
Gordon, John Brown (1832–1904), Confederate general, later governor of and senator from Georgia; born Upson County, Ga.; lecturer on Civil War; author of 'Reminiscences of the Civil War'.
Gordon, Judah Loeb, or **Leon** (1830–92), Russian-Hebrew writer, born Wilno, Lithuania; called "poet laureate of the Haskalah" (movement for Jewish enlightenment); lyrics, satires.
Gordon riots, precipitated in London on June 2, 1780, by a mob led by Lord George Gordon; caused by objections to repeal in 1778 of Catholic penal laws; Roman Catholic chapels and houses of magistrates were burned; Newgate prison wrecked and prisoners liberated.
Gordon setter, a hunting dog, *color picture* D-113, *table* D-118
Gordy, Wilbur Fisk (1854–1929), educator and historian, born near Salisbury, Md. ('A School History of the United States'; 'Colonial Days'; 'Leaders in Making America').
Gore, Francis (1769–1852), lieutenant governor of Upper Canada 1806–17; born Kent, England.
Gore-Booth, Eva (1872–1926), Irish author; well known for 'The Perilous Light' and other poems; in poetic drama 'The Death of Fionavar' she pleaded for peace ('House of Three Windows'; 'Shepherd of Eternity').
Gorgas (*gôr'găs*), **William Crawford** (1854–1920), U.S. Army officer and sanitary engineer G-142–3, *picture* G-142
Hall of Fame, *table* H-249
Panama Canal P-56, G-142
Gorge, a young valley E-188
Gorges (*gôr'jēs*), **Sir Ferdinando** (1566?–1647), British colonist, founder of Maine, called "father of English colonization in America"
in Maine M-56
in New Hampshire N-154
Gorgias (*gôr'jĭ-ăs*) (about 480–380 B.C.), Greek orator and sophist noted for florid eloquence; one of Plato's dialogues is named for him.
Gorgons (*gôr'gŏnz*), in Greek mythology, three female monsters P-154
Gorgonzola (*gôr-gŏnt-sō'lä*), town in Lombardy, Italy, center of cheese-producing district.
Gorgonzola cheese C-206
Gorham, Nathaniel (1738–96), businessman and statesman, born Charlestown, Mass.; member of Continental Congress 1782, 1783, and 1785–87, president 1786; signed United States Constitution.
Gorilla, the largest of the apes G-143, *pictures* G-143, Z-357, A-271
hand, *picture* A-270
price paid for Bushman Z-358
Gorizia (*gō-rēt'sē-ä*), Italy, 20 mi. n.w. of Trieste; pop. 30,265; capital of former Austrian crownland of Gorizia and Gradisca; ceded to Italy by Treaty of Rapallo (1920): *map* E-425
Italians capture W-225, 226
Gorki, also **Gorky** (*gôr'kĭ*), Russia, formerly (until 1932) Nijni Novgorod, trade center of e. on Volga River, 255 mi. n.e. of Moscow; pop. 900,000: *maps* R-266, E-417, *picture* R-258
fairs F-12
Gorky, Maxim ("Maxim the Bitter"), real name Alexis Peshkov (1868–1936), Russian revolutionist, short-story writer, dramatist, and novelist, born Nijni Novgorod; obliged to earn own living at age of nine; wrote realistically of the oppressed and outcasts of society: R-295, *pictures* R-289, R-295
chief works R-296, D-137
Görlitz (*gûr'lits*), Germany, town on Polish border, on Neisse River, 55 mi. e. of Dresden; pop. 85,686: *maps* G-88, E-424
Gorman, Willis (1816–76), American lawyer, soldier, and 2d territorial governor of Minnesota (1853–57); served in Mexican war and was made brigadier general for distinguished services in Civil War.
Gorrie, John (1803–55), physician, born Charleston, S. C.; settled in Apalachicola, Fla., 1833; invented mechanical refrigeration; obtained patent 1851; applied principle to cooling sickrooms and hospitals; statue presented to Statuary Hall 1914 by state of Florida: R-96
Gorse. *See in Index* Furze
Gorton, Samuel (1592?–1677), American colonist, author, founder of "Gortonites," religious sect; born Gorton, England; removed to Mass. 1637; after stormy years because of religious beliefs settled in Warwick, R. I., 1648; in R. I. legislature 1649–66.
Gortyna (*gôr-tĭ'na*), next to Cnossus largest and most powerful city of ancient Crete, near center of island.
Gosart, or **Gossart, Jenni** (died 1532), real name of Jan Mabuse, first of the "Italianized" Flemish painters.
Goschen, Sir William Edward (1847–1924), British diplomat; ambassador to Germany, 1908–14: W-218
Gosden, Freeman Fisher (Amos) (born 1899), radio and television writer, also actor, born Richmond, Va.; with Charles J. Correll created radio serial 'Amos 'n Andy' (entitled 'Sam 'n Henry' 1925–27) and wrote script for television serial 'Amos 'n Andy' from July 1951.
Gos'hawk H-291, 292, 293, *pictures* H-292, A-250
Goshen (*gō'shĕn*), the region in Egypt occupied by the Israelites, w. of modern Suez Canal (Gen. xiv, 10).
Goshen, Ind., city on Elkhart River 23 mi. s.e. of South Bend; pop. 13,003; flower-growing; iron products, furniture, rubber goods; Goshen College (Mennonite): *map* I-78
Goshen College, at Goshen, Ind.; Mennonite; chartered 1894; opened 1894; arts and sciences, nursing, theology.
Goshenite, a gem stone J-349
Goslar, Germany, city in Lower Saxony; has kept its medieval heritage: a Romanesque palace from the 11th century and several Romanesque and Gothic churches; belonged to the Hanseatic League; tourist center for Harz Mountain trips; pop. 40,735.
Gos'nold, Bartholomew (died 1607), English navigator and explorer, leading colonist of Jamestown, Va.; died there
New England explorations A-190, C-118
Gospels, four books of New Testament giving account of life and teachings of Jesus Christ J-339
Book of Kells B-236
Gos'samer, extremely fine filamentous substance spun by spiders S-343, 345
Gosse (*gŏs*), **Sir Edmund William** (1849–1928), English poet and critic ('Aspects and Impressions', criticism; 'Father and Son', biography;

with Richard Garnett English Literature an Illustrated Record)

Gosse Philip Henry (1810–88) English naturalist ("The Ocean The Romance of Natural History)

Gosta Berling s Saga story by Selma Lagerlöf based on legends and traditions about a romantic character who lived in a provincial part of southern Sweden during the first part of the 19th century

Göta (*yū tä*) **Canal** in Sweden S 462 *map* N 301 *See also in Index* Canals *table*

Götaland s part of Sweden S 462

Gotama (*gō tə mə*) or **Gautama** family name of Buddha B 338

Göteborg (*yū tə bôr*) also **Gothenburg** 3d city chief port and a factory center of Sweden on s w coast at mouth of Göta River ships furniture textiles pop 355 991 S 463 *maps* N 301, E 416 424

Gotha (*gō tə*) Germany town 80 mi s w of Leipzig pop 57 639 publishing center was joint capital with Coburg of Duchy of Saxe Coburg Gotha Friedenstein Castle *maps* G 88 E 424–5

Gotham a village in Nottinghamshire England inhabitants of which are said to have played the fool in order to dissuade King John from settling there and burdening them with expense of royal residence hence called Wise Men of Gotham Also nickname of New York City first used by Washington Irving in Salmagundi (1807)

Gothenburg Sweden *See* Göteborg *in Index*

Gothic in art P 24 38
late Gothic painting P 24–25c *color pictures* P 25–25d

Gothic alphabet G 83
German printing G 82

Gothic architecture A 313–18
American revival A 320
arch A 317 *picture* A 316
Belgium Louvain s Town Hall *picture* L 337
buttress A 317
cathedrals C 139 *picture* C 139 *See also* in *Index* Cathedral
decoration A 317
English Canterbury cathedral C 114–15 *picture* C 115 Exeter cathedral *picture* E 352 Gloucester cathedral *picture* E 352 Lincoln cathedral *picture* E 352 Houses of Parliament *pictures* G 173 L 303 P 87–8 Salisbury Cathedral *picture* A 400g Westminster Abbey W 98 9 *picture* W 98
fan vaulting A 317
flamboyant style *picture* W 191
flying buttresses A 316 *pictures* A 315 E 440
French A 313–17 Amiens cathedral *picture* A 235 Notre Dame cathedral *pictures* A 314–15 Reims cathedral *picture* C 139 Strasbourg cathedral *picture* A 181
German Cologne cathedral *picture* C 386
Guild halls Cloth Hall at Ypres *pictures* Y 344
Italian Assisi s church *picture* I 271 Florence cathedral (duomo) *picture* F 147 Giotto s tower *picture* G 111 Milan cathedral I 278, 279 *pictures* E 440 I 277 Siena bell tower *picture* I 285
modern Cathedral of St John the Divine *picture* A 323, Houses of Parliament *pictures* G 173 L 303 P 87–8
origin of name A 318
perpendicular A 317 *picture* E 352
Romanesque compared with A 316
sculpture as decoration S 78 78a *picture* S 78
stained glass windows G 125, A 317, *picture* G 125

Gothic furniture F 319d

Gothic language G 83

Gothic type B 235
angular Gothic examples B 235 237

Gothic woodcarving *picture* W 191

Goths G 143 4 E 431–2
ancient home S 462
migration *map* M 237
Visigoths Alaric s leadership A 129
kingdom in Spain S 320 G 143

Gotland or Gottland largest island in Baltic Sea one of Sweden to which it belongs 1142 sq mi farming stock raising *maps* N 301 L 416

Götterdämmerung (*gū tĕr dem mərung*) fourth opera in Wagner s series Der Ring des Nibelungen story O 393

Gottingen (*gut ing ən*) Germany town 60 mi s of Hanover pop 78 680 University of Gottingen founded 1737 by George II had a noted library of modern literature *map* L 424

Gottschalk (*got shalk*) **Louis M** (1829–69) pianist and composer born New Orleans La greatest success in playing his own compositions throughout U S and Latin America died at Rio de Janeiro best known for piano pieces (The Last Hope Le Bananier)

Gouache (*guash*) in painting P 37c

Goucher College at Baltimore Md for women founded 1885 as Woman s College of Baltimore opened 1888 changed name 1910 arts and sciences

Gouda (*gou də*) cheese C 208

Goudge Elizabeth (born 1900) English novelist born in Wells England grew up *in Wells and Ely* cathedral towns which form the background of A City of Bells other books Green Dolphin Street Pilgrim s Inn Gentian Hill

Goudy (*gou di*) **Frederic W** (1866–1947) type designer and printer born Bloomington Ill created more than a hundred type faces author of several books on lettering and type design lecturer on type design and typography founded *Village Press* (name given to his private press wherever he lived) his typographic style has been important in fixing contemporary trends T 230

Gouges (*gōzh*) **Olympe de** (1748–93) a French pioneer of feminism guillotined for defending Louis XVI treatise on women s rights W 184

Gough (*guf*) **Sir Hubert** (born 1870) British general commanded Fifth Army during German Somme offensive March 1918 made scapegoat for failure of his superiors to give him adequate support

Gough John B (1817–86) American temperance lecturer born England *popular for his earnest* but amusing addresses

Gough Island in Atlantic Ocean A 451

Gouin (*gō an*) **Sir Lomer** (1862–1909) Canadian lawyer and statesman Liberal leader premier and attorney general of Quebec 1905–20 Canadian minister of justice in King cabinet *1921–24 lieutenant* governor of Quebec 1929

Goujon (*gō zhôn*) **Jean** (1515?–66?) French Renaissance sculptor and architect skillful metalworker S 78d
Fountain of the Nymphs *picture* S 79

Goulburn River in Victoria Australia tributary of Murray River 330 mi long navigable in its lower course

Gould George Jay (1864–1923) capitalist born New York City eldest son of Jay Gould controlled many railroads, including the Missouri Pacific and the Wabash

Gould Jay (1836–92) self made capitalist, born Roxbury N Y early associate of Daniel Drew and Jim Fisk in *manipulating Erie railroad* stocks gained mastery over what became the Gould system of roads with Fisk tried to corner gold market causing Black Friday panic

Gould Morton (born 1913) pianist and composer born Richmond Hill Long Island N Y used jazz rhythms in compositions (American Symphonette Concertette)

Gould Sabine Baring *See in Index* Baring Gould

Gould Foundation *See in Index Ed* win Gould Foundation

Gounod (*gō nō*) **Charles François** (1818–93) French composer of sacred and dramatic music G 144 *picture* G 144
Faust opera O 390
Romeo and Juliet opera O 393

Goupil (*gū pē*) **Saint René** (1607?–42) French missionary born Anjou France lay brother of Society of Jesus captured by Iroquois on *way to Huron mission and killed* near what is now Auriesville N Y canonized 1930

Gour or **gaur** (*gour*) wild ox of India C 141 *picture* C 141a

Gouraud (*gō rō*) **Henri Joseph Eugène** (1867 1946) French general in World War I high commissioner in Syria and commander in chief in the Levant in 1919 military governor of Paris 1923–37

Gourde monetary unit of Haiti his *torical value 20 cents*

Gourd head popular name for wood ibis S 402

Gourds plants related to melon and squash G 144
cups made from *picture* P 263

Gourgues (*gorg*) **Dominique de** (1530?–1593) French soldier and adventurer F 150

Gourlay Robert Fleming (1778–1863) Canadian author and agitator born Fifeshire Scotland came to Canada 1817 known for criticism of the poor laws and of the Family Compact banished from Canada until 1842 (Statistical Account of Upper Canada)

Gourmont (*gor mōn*) **Rémy de** (1858–1915) French critic and poet second only to Anatole France as an authority on contemporary French literature defender of naturalism of Huysmans and symbolism of Mallarmé

Government *G 144–8 Reference Outline* P 361–2 *See also* Fact Summary with each state article *also in Index* Democracy United States government and the various branches and functions of governments by name *also* names of countries provinces and states *subhead* government
anarchism C 427
aristocracy G 145
autocracy G 146 D 63 65
beginnings tribal life F 18a–b D 63
bibliography P 362
cabinet system C 3–4
citizenship C 318–22 *pictures* C 318–21 *Reference Outline* C 321–2
colony dependency and dominion C 390
communication agencies C 424d–e
Communism C 425–7
constitutions C 457
county C 498 England F 358

definition of G-145
democracy D-63–7: individual freedom I-115–20, *Reference-Outline* I-117–20
development G-145
dictatorship D-88–9, G-146, D-65: how the dictator rules F-44
economic activity E-224
family and tribal F-18*a*–19, D-63
Fascism F-43–4
federal: definition U-356; United States and Canada compared C-91
feudal system F-60–2
international law I-189–91
laws, what and why they are L-139–40, G-145
monarchy G-146, 145, D-63: constitutional monarchy D-65
municipal M-450–1
naturalization N-43
Nazism G-98–100
oligarchy G-146, D-63
political parties P-357–60
political science P-360–2, *Reference-Outline* P-361–2
propaganda C-424*g*
religion and G-145
Socialism S-215–18, *picture* S-216
social studies include S-218*c*
state S-384*b*–5
taxation T-24–5, *chart* T-24*a*
totalitarianism G-146
treason and sedition G-146
tribes or clans D-63

"Government of the people, by the people, for the people," quotation from Lincoln's Gettysburg Address

Government ownership E-224. *See also in Index* Forests and forestry *subhead national* forests. Irrigation and reclamation. *subhead* United States, Lands, public; Municipal ownership; National parks; State ownership
Alaska: railroads A-134; seal herd A-134
Australia A-484
Brazil B-293
Canada C-83: forests C-87; Saskatchewan S-47–8
England E-356, E-372
France P-83*a*
Great Britain E-354
Hungary H-448
India I-64
Iran I-223
Ireland, Republic of I-230
Japanese camphor C-55
Java railroads J-327
natural resources C-454
New Zealand N-228*a*
public utilities P-430–1, C-308
railroads R-68
Rumania R-255
Russia R-281: factories R-269, 270; land R-264, 269
Siam (Thailand) S-170
Socialism S-215–18
South Africa transportation S-243
Spain S-317
Sweden S-463
Switzerland S-481
Turkey T-219
United States: natural resources C-454; utilities P-430–1, C-308
Yugoslavia Y-346

Government Printing Office, the official printing and publishing plant of the U.S. government, established 1860 by act of Congress; supplies all printing, publishing, and stationery needs of the federal government. Office is under supervision of a Congressional committee and is managed by the Public Printer who is appointed by the president with the approval of the Senate. Superintendent of documents has charge of the sale of government publications: *picture* W-31

Government regulation of industry. *See also in Index* Government ownership; Municipal ownership; State ownership
advertising A-25: postal rules A-24
agriculture A-68–9, W-117–18
aviation A-537
bus B-364*a*, I-198
chain stores C-182
cold storage C-381
commerce, internal: Federal Trade Commission F-50; Interstate Commerce Commission I-198, R-69*d*, R-223; restraint of trade, *monopolies M-359–60*
communication agencies C-424*d–e*
conservation C-454. *See also in Index Conservation*
cotton grades C-495
Federal Trade Commission, United States *F-50*
installment buying I-165–6
international trade I-195, 196, 197
Italy *F-44*
laissez-faire doctrine I-130, 133
liquor *control P-416–17*
meat packing M-154, *pictures M-156a, I-29*
monopolies M-359–60
narcotics N-13, H-333, O-399
New Jersey corporations N-158, 167
opium trade O-399
petroleum resources P-181
public utilities P-430–1, E-314, W-70, U-368
pure-food laws P-442–3, C-112
radio R-42, 48–50, H-421
railroads A-391–2, *I-198*, R-223, R-69*c–d*
Russia R-280
salmon A-133
sweatshop laws S-460
television T-54*a, d*
tobacco T-142
trusts T-201, 202, U-383–4
water power W-70, E-314, U-368

Governor, of states in the U.S. duties and powers S-385
early powers A-395
first women elected W-185

Governor and Company of Adventurers of England, trading into Hudson's Bay, The H-438

Governor general, in Canada C-91, 92
early powers C-97
flag F-136*a*, *color picture* F-131

Governors Island, fortified island in New York City harbor at junction of Hudson and East rivers; area about 125 acres; called Nooten Island by Dutch colonists; received present name in late 17th century when colonial governors established a summer residence there. Now site of Fort Jay and headquarters of First Army of the U.S.: *map* N-222

Gower, John (1325?–1408). English poet, called by Chaucer "moral Gower" and by Lowell "undertaker of the fair medieval legend"; chief work, 'Confessio Amantis', includes many moral stories warning a lover against the vices of that day.

Gowrie, John Ruthven, 3d earl of (1577?–1600), Scottish nobleman killed, with his brother Alexander, in apparent attempt to assassinate King James VI of Scotland; some evidence that "Gowrie's Conspiracy" may have been a story contrived to hide the king's fault in a quarrel which led to violence.

Gowrie, William, first earl of (1541?–84), Scottish nobleman; concerned in murder of Rizzio in 1566; custodian of Mary, queen of Scots, at Lochleven; captured James VI of Scotland in 1582; executed for treason by order of James.

Goya (gō'yä) y Lucientes, Francisco José de (1746–1828), Spanish portrait painter, lithographer, and etcher; greatest Spanish artist between Velásquez and Fortuny; notable portraits of Charles IV and Queen Maria Louisa, duchess of Alva, duke of Wellington: P-31*a*, D-140*b*
early flying, *picture* A-101
etchings E-387
'Señora Sabasa García', *color picture* P-31*a*
tapestry designed by, *picture* M-27

Goyaz, Brazil. *See in Index* Goiás

Goyen, Jan Josephszoon van (1596–1656). Dutch landscape painter, depicted typical landscapes with naturalistic truth unmixed with sentiment; cool tints in the skies and scanty detail in foliage.

Gozo (gōd'zō), island of British colony of Malta in Mediterranean 3 mi. n.w. of Malta; 26 sq. mi.: *map* E-425

Gozzi (gōt'sē), Carlo (1722–1806), Italian dramatist; wrote plays, satirical dramas founded on fairy tales, and tragedies with a comic element; 'Turandot' best known.

Gozzoli (gōt'sō-lē), Benozzo (bā-nōt'tsō) (1420–98?), Florentine painter, real name Benozzo di Lese; worked first under Fra Angelico; excelled at richly decorative religious frescoes ('Madonna and Child with Saints'; 'Journey of the Magi to Bethlehem'; frescoes depicting lives of St. Francis and St. Augustine).

Grabau, Mary Antin. *See in Index* Antin, Mary

Graben (grä'bən), street in Vienna, built over medieval moat V-472

Grabhorn, Edwin and Robert, brothers, contemporary American printers for many years working in San Francisco; known for skillful use of fine types and careful composition; leaders in group sometimes called California school of printers.

Grac'chus, Gaius Sempronius (153–121 B.C.), Roman popular leader, son of Cornelia and brother of Tiberius Gracchus; as tribune of the people 123–121 B.C. carried out his brother's judicial and social reforms: R-186
aids poor classes P-368

Gracchus, Tiberius Sempronius (163–133 B.C.), Roman tribune in 133 B.C. proposed agrarian laws and other reforms for relief of poor; murdered in riot caused by his attempt to secure re-election as tribune: R-186

Grace, in religion, the enjoyment of God's favor; spiritual gift of God by which man is able to choose the right and find salvation; in Roman Catholic church the state of grace is held to be obtained through the sacraments. The term grace is also used for a prayer before or after a meal, asking blessing or returning thanks.

Grace, days of. *See in Index* Days of grace

Grace note. *See in Index* Music, *table* of musical terms and forms

Graces, in Greek mythology, three daughters of Hera and Zeus: Euphrosyne (joyfulness), Aglaïa (brightness), and Thalia (bloom), goddesses of grace and charm
Aphrodite and A-274

Gracián (grä-thē-än'), Baltasar (1601–58), Spanish writer and Jesuit; style concise and epigrammatic, but sometimes obscure; best known for philosophical novel 'El Criticón'.

Grackle, a blackbird
boat-tailed B-203
bronzed B-203
purple B-203

Gradation, in geology, the building up (aggradation) or wearing down (degradation) of land E-181

Grady Henry Woodfin (1850–89) journalist and orator born Athens Ga in 1879 he bought share in *Atlanta Constitution* and as editor did much to restore friendly relations between North and South lectured on The New South
monument in Atlanta A 451

Graeae (*grē'ē*) in Greek mythology the gray ones three sisters Dino Enyo and Pephredo daughters of Ceto and Phorcys gray haired from birth
Perseus aided by P 154

Graeco Roman wrestling W 305

Graetz (*grāts*) **Heinrich** (1817–91) German Jewish historian born province of Posen professor University of Breslau 20 years most noted for his scholarly history of the Jews which has been translated into several languages

Graf or Graff Urs (1485?–1527) Swiss engraver and goldsmith E 387

Graffenreid (*grăf'ĕn rīt*) **Christopher** Baron de early settler in North Carolina N 278

Grafly Charles (1862–1929) sculptor born Philadelphia Pa noted for symbolical figures and groups and portrait busts one of foremost American portrait sculptors of his time instructor Pennsylvania Academy of Fine Arts and Boston Museum of Fine Arts

Graf Spee Admiral German battleship W 243

Grafting of plants P 296
bud grafting P 296 rubber tree P 237 *picture* P 237
fruit trees F 303 *pictures* F 305
grapevines G 155 156

Grafton N D trade center in near Park River 15 mi w of Minnesota border pop 4901 grain and livestock shipping *map* N 289

Graf Zeppelin German dirigible B 34

Graham George Perry (1859–1941) Canadian journalist and statesman Liberal leader in Ontario legislature 1898–1907 later in House of Commons minister of railways and canals 1907–11 1923–26

Graham Gwethalyn (Mrs David C Yalden Thomson) (born 1913) Canadian novelist born Toronto *Earth Looks* stress social problems (Swiss Sonata *Earth and High Heaven*)

Graham James Viscount Dundee *See in Index* Claverhouse

Graham Martha dancer and choreographer leading exponent of the modern dance in U S born Pittsburgh Pa began study with Ruth St Denis 1916 New York debut 1926 instructor at Benningtn College Vermont and at the School of American Ballet New York City choreographies include Frontier *American Document* D 141 *picture* D 141

Graham Robert Bontine Cunninghame *See in Index* Cunninghame Graham

Graham Shirley (born 1906) Negro author and composer born Indianapolis Ind wrote and composed music drama Tom Tom (biographies works on Frederick Douglass Benjamin Banneker George Washington Carver Paul Robeson and Phillis Wheatley)

Graham Sylvester (1794–1851) reformer born Suffield Conn advocated temperance vegetarianism use of whole wheat (graham) bread
Graham flour F 167

Graham Thomas (1805–69) Scottish chemist originated term colloids and discovered Graham's law of diffusion rate of gases is inversely as square root of their densities

Graham William Alexander (1804–75) political leader born Lincoln County N C U S *senator* 1840 43 governor of North Carolina 1845–49 secretary of navy 1850 52 opposed secession until outbreak of Civil War

Graham William Franklin (Billy) (born 1918) evangelist born near Charlotte N C ordained Southern Baptist minister 1939 and held evangelistic meetings in S and all parts of U S 1946 hymn and gospel records television preacher author of religious books (Jesus with Me)

Graham flour wheat flour F 167
bread 285 *picture* B 297 8

Gralamite a variety of asphalt A 424

Grahamstown town of South Africa city in Cape of Good Hope Province 80 mi ne of Port Elizabeth pop 24 741 ships ostrich feathers Rhodes University College St Andrews College *map* A 47

Grain Lucille (1821?–190) Danish soprano born Copenhagen Denmark appeared successfully at Paris opera popular in London where she danced Pas de Quatre (1845) with Taglioni Grisi and Carlotta D 148

Grail Holy *See in Index* Holy Grail

Grain *See in Index* Cereal crops

Grain unit of measure W 87

Grain grinding *See in Index* Flour and flour milling

Grain alcohol *See in Index* Ethyl alcohol

Grain elevator G 147 *picture* G 147
Arlington Ore *picture* O 409
Buenos Aires *picture* A 335
Fremont Neb *picture* N 105
Kansas City Kan *picture* K 14
Manitoba Canada *picture* M 79
Minneapolis M 275 *picture* M 165
North Dakota *picture* N 281

Grain exchange *See in Index* Board of trade

Grainger Percy Aldridge (born 1882) American pianist and composer born Melbourne Australia settled in U S 1915 influenced by friend Edvard Grieg compositions based chiefly on folk music (Molly on the Shore Shepherd's Hey Country Gardens)

Grains of paradise or **melegueta pepper** a spice S 339

Grain weevil W 85

Gram metric unit of weight M 184

Gramatky Hardie (born 1907) artist illustrator and author of children's books born Dallas Tex grew up in California worked at Walt Disney's studio before going to live in New York City Children's books Little Toot Loopy Hercules Creeper's Jeep

Gram atomic weight in chemistry C 212

Gramineae *See in Index* Grass family

Grammar G 147 9 *table* G 148
adjective A 21 G 148 *table* G 148
adverb A 28 G 148 *table* G 148
conjunction C 436 G 147 table G 148
conversation aided by C 460
diagraming a sentence G 149
interjection G 147 *table* G 148
noun N 306 G 147 *table* G 148
preposition P 407 G 148 *table* G 148
pronoun P 417–18 G 148 *table* G 148
punctuation P 436 438 G 147 *table* G 148
rhetoric distinguished R 132
sentence S 100–1 G 148–9
teaching L 100*f–g*
trivium medieval education A 340
verb V 449–50 G 148 table G 148

Gramophone another name for phonograph *See in Index* Phonograph

Grampian Mountains or **Grampian Hills** principal mountain mass in Scotland really a series of spurs 150 mi long rugged on ne side but *good pasture land on* s S 63 *map* B 321

Grampus or **killer whale** a species of dolphin (*Orcinus orca*) boldly marked in black and white W 224 *picture* W 113

Granada (*grä nä'dä*) Nicaragua one of chief cities pop 21 741 founded 1524 N 233

Granada last Moorish kingdom in southern Spain but 11 000 sq mi divided into three modern provinces of which Granada (4838 sq mi pop 782 953) is one
flag of Middle Ages F 136*c color picture* F 132
history M 389

Granada Spain once capital of Moorish kingdom now capital of province of same name 120 mi ne of Gibraltar pop 154 378 with suburbs university S 320 *maps* S 312 E 416 425
Alhambra A 167 S 320 *picture* S 321

Granados y Campina (*grä nä'dōs ē käm pē'nä*) **Enrique** (1868 1916) Spanish composer best known for Spanish dances and opera Goyescas died as passenger on *Sussex* which was torpedoed during World War I

Granby Quebec town on Yamaska River 60 mi se of Montreal pop 21 989 chiefly French rubber goods tobacco lumber furniture foundry products *map* C 72–3

Granby Reservoir in Colorado C 414*a–b maps* C 408 C 414*b*

Gran Chaco *See in Index* Chaco

Gran Chimu Peru *See in Index* Chanchan

Grand Alliance league of European powers formed against Louis XIV of France in 1689 and renewed in 1701 A 497

Grand Alliance or **Quadruple Alliance** (1815) E 433

Grand Alliance War of or **War of the League of Augsburg** (1689–97) American phase K 47

Grand Army of the Republic a society of Civil War veterans organized at Decatur Ill in 1866 P 98

Grand Banks *See in Index* Newfoundland Banks

Grand Bassam (*bas säm'*) French West Africa former port of Ivory Coast had pop of 7000 shipped rubber cotton coconuts port abolished 1951

Grand Canal China C 105*a* C 272 *maps* C 260 A 406

Grand Canal Venice V 444 *pictures* I 267 V 445 448
Turner's painting *color picture* P 29*d*

Grand Canary Spanish **Gran Canaria** one of Canary Islands 74 mi from coast of northwest Africa 644 sq mi pop 281 351 healthful climate large tourist trade fishing and vineyards *map* A 46

Grand Canyon of Colorado River in n Arizona G 149–51 *map* C 414*b pictures* G 149–50 C 414*a color picture* N 25 N 260
discovered by Coronado C 486
national monument N 35 *maps* A 352 N 18
national park N 35 *color pictures* N 25 *maps* A 352 N 18

Grand Canyon, of Snake River, small canyon in Wyoming near the Idaho boundary, *map* I-14
Grand Canyon of the Snake River, long gorge in Snake River where it forms part of Idaho-Oregon boundary; deepest canyon in North America; averages 5500-ft. depth for 40 miles; deepest point 7900 ft. in southern part called Hell's Canyon or Seven Devils Canyon or Box Canyon: O-408, I-13, *map* I-14
Grand Canyon of the Waimea, Hawaiian Islands H-288*a*
Grand Central Station, New York City, *picture* N-225
Grand Coulee Dam, in Washington, on the Columbia River C-415*b*, I-251, D-6, 11*b*, *maps* W-45, C-415*b*, *pictures* D-11, W-67, 69. *See also in Index* Dam, *table*
Coulee Dam National Recreation Area N-38*d*, *map* N-18
salmon industry S-29
size compared with other structures, *diagram* D-11*b*
Grand Dixence Dam, in Switzerland, on Dixence River. *See also in Index*, Dam, *table*
Grande Comore, island. *See in Index* Comoro Islands
Grandee, title of honor borne by highest class of Spanish and Portuguese nobility; formerly implied important privileges
Grand Falls, New Brunswick, Canada, town on St. John River 90 mi. n.w. of Fredericton; pop. 2365; agricultural region; lumber and pulpwood; fishing: N-138–138*a*, *map* C-73
Grand Falls, of the Hamilton River, Labrador L-76, *map* C-73
Grandfather clause, provision formerly included in constitution of several Southern states which excuses from other suffrage tests those who have served in any war and their descendants and those who were voters before Jan. 1, 1867, and their descendants; adopted as means of restricting suffrage to white voters; declared unconstitutional 1915.
Grandfather Frost, Russian Santa Claus R-273
Grandfather's clock W-55, *picture* W-56
Grand fir. *See in Index* Giant fir
Grand Forks, N. D., 2d city in state, on e. boundary, at junction of Red River of the North and Red Lake River; pop. 26,836; flour, packing-house products, potato products; beet-sugar refining area: N-291, *maps* N-289, U-252–3
state-owned mill and elevator, *picture* N-281
University of North Dakota, *picture* N-292
Grand Haven, Mich., port and summer resort on Lake Michigan at mouth of Grand River 25 mi. w. of Grand Rapids; pop. 9536; fishing, fruit, and celery interests; various manufactures; government weather station; state park: *map* M-227
Grandi (*grän'dē*), **Dino** (born 1895), Italian statesman; identified with Fascist party from its beginning and played conspicuous part in Fascist march on Rome; minister of foreign affairs 1929–32; ambassador to England 1932–39; minister of justice 1939–43; sentenced to die 1944 for taking part in overthrow of Mussolini, escaped to Portugal.
Grand Island, Neb., city about 85 mi. w. of Lincoln; pop. 22,682; railroad shops; livestock marketing; army ordnance installation; beet sugar, flour; State Soldiers and Sailors Home: N-106, *maps* N-103, U-252
Grandison, Sir Charles. *See in Index* 'Sir Charles Grandison'
Grand Junction, Colo., agricultural, industrial, and mining center at junction of Colorado and Gunnison rivers, near Utah border; pop. 14,504; Mesa County Junior College: *maps* C-408, U-252
Grand Jury J-366. *See also in Index* Law, *table* of legal terms
Henry II establishes H-335
Grand Lake, largest lake of Newfoundland, length 56 mi.; 192 sq. mi.: *map* C-73
Grand Lama. *See in Index* Dalai Lama
Grand Manan (*ma-nän'*) **Island**, at mouth of Bay of Fundy; pop. 2687: N-138, *map* C-73
Grand' Mère (*grän mêr'*), Quebec, lumber-manufacturing city on St. Maurice River, about 25 mi. n. of Trois-Rivières; pop. 11,089; pulp, paper, furniture, rubber goods
Grand Monarch, The. *See in Index* Louis XIV, king of France
Grand mufti, chief of Mohammedan theologians. *See also in Index* Mufti
Grand Old Man, Gladstone G-118, *picture* G-118
Grand Old Party, name given to Republican party by campaigners in 1880, since shortened to G. O. P.
Grand opera. *See in Index* Opera
Grand piano P-249, *picture* P-250
Grand Portage, nine-mile overland carrying route in n.e. Minnesota between Lake Superior and Pigeon River, famous in American fur trade and exploration history; trading post maintained here by North West Company.
Grand Prairie, Tex., city 12 mi. s.w. of Dallas; pop. 14,594: *map*, *inset* T-90
Grand Pré (*grän prā*), Nova Scotia, historic village about 45 mi. n.w. of Halifax, in farming and fruit-growing district; famous as scene of Longfellow's 'Evangeline': A-5, 6
statue of Evangeline, *picture* A-6
Grand Prix de Rome. *See in Index* Prix de Rome
Grand Rapids, Mich., "furniture capital of United States"; pop. 176,515: G-151, *maps* M-227, U-253
furniture market F-319*a*
Grand Remonstrance, protest against misgovernment presented to Charles I (1641) by English House of Commons; the king's impeachment of and attempt to arrest the 5 leaders responsible for the Remonstrance were causes of the English Civil War: C-191
Grand Rhone, in France, branch of Rhone River R-146
Grand River, Labrador. *See in Index* Hamilton River
Grand River, in Oklahoma. *See in Index* Neosho River
Grand River, S. D., rises in n.w.; flows e. to Missouri River: *maps* S-296, 302
Grand River Dam (Pensacola Dam), in Oklahoma, on Grand (Neosho) River, *picture* O-374
Grand Teton National Park, in Wyoming N-35, *map* N-18, *pictures* N-34, F-237, W-315
Grand Teton Peak, in Wyoming, in Teton range of Rocky Mountains (13,766 ft.) N-35, *picture* N-34
Grand Trunk Pacific Railroad C-83
Grand Union flag, or **Cambridge flag** F-130*d*, *color picture* F-128
Grand white fir. *See in Index* Giant fir
Grange, Harold E. (Red) (born 1904), football player, born Wheaton, Ill.; University of Illinois halfback 1923–25; played professional football 1925 through 1934; wore number 77 on uniform; author of 'Zuppke of Illinois': F-232
Grange, National. *See in Index* National Grange
Granger movement, for regulating railroad rates A-391–2, R-69*d*
Grania (*grä'ni-ä*), or **Grainne** (*grän*), in Celtic mythology the Helen of the Fenian cycle of old Irish tales, beautiful young betrothed of the old Finn; deserts him for Dermot, but weds him when Dermot dies.
Granicus (*grą-nī'kŭs*), ancient name of small river in n.w. Asia Minor where Alexander the Great won first victory over Persians 334 B.C.
Granite G-151
commercial types Q-2
geological classification. *See in Index Rock, table*
"giant" granite crystals R-167
quarrying Q-2, 3, *picture* N-154
United States quarries G-151: New Hampshire *picture* N-153; Vermont V-460, *picture* V-460
weight and strength, *table* R-167
Windsor green V-460
Granite City, Ill., manufacturing city near Mississippi River, just n. of St. Louis, Mo.; pop. 29,465; iron and steel, coke, chemicals, graniteware, corn products: *map*, *inset* I-37
Granite Hills, in Vermont V-459
Granite Peak, in Rocky Mts., highest point in Montana (12,850 ft.); in s. part of state, n.e. of Yellowstone National Park: *maps* M-374–5, 367
Granite State, popular name for New Hampshire.
Graniteware E-342
Granny knot, or **lubber's knot** K-60
Gran Quivira (*grän kē-vē'rä*) **National Monument**, in New Mexico N-35, N-181, *map* N-18
Granson, battle of (1476) C-195
Grant, Duncan (born 1885), British painter; a modernist strongly influenced by Cézanne ('The Lemon Gatherers'; 'Tight-rope Walker').
Grant, Frederick Dent (1850–1912), American general; accompanied father, Gen. U. S. Grant, in many Civil War campaigns; graduated West Point 1871 but resigned from army 1881; colonel of volunteers 1898, served in Cuba and Philippines, successively promoted until major general in regular army.
Grant, George Monro (1835–1902), Canadian clergyman and educator, known for his eloquence on political platform scarcely less than in pulpit; for 25 years principal of Queen's University; made it one of leading Canadian institutions.
Grant, Julia Dent (1826–1902), wife of President Grant W-128*a*, G-152
Grant, Robert (1852–1940), judge and author, born Boston ('Unleavened Bread'; 'The Chippendales'; 'Fourscore—An Autobiography').
Grant, Ulysses S. (1822–85), 18th president of U. S. G-152–3, *picture* G-152
administrations (1869–77) G-153
Alabama claims arbitrated A-129
arbitration, Great Britain-Portugal A-294
Boston fire B-261
Centennial Exposition G-153
Chicago fire C-238, *picture* C-237
Custer massacre C-531, I-110*b–c*
15th Amendment U-347–8, 355
first national park N-19
Hayes-Tilden election H-296–7
panic of 1873 G-153
Prohibition party organized P-416
Specie Resumption Act G-153, M-338
Union Pacific completed, *picture* U-382
Civil War service G-152–3, C-335, 336: Chattanooga C-199
Robert E. Lee and L-157, G-152–3, *picture* C-433*b*

Sheridan aids S 148–7
Sherman and S 147–8
Shiloh S 148
Vicksburg V 467 G 152
Hall of Fame *table* H 249
home in Galena Ill *picture* I 42
last years G 153
portrait on $50 bill *table* M 339
tomb G 153 *picture* N 220
wife W 128a G 152
Grant General sequoia tree *See in Index* General Grant
Grant Land Canada new part of Ellesmere Island new forest and
Grant Park Chicago C 234 *maps* C 230 231b *pictures* C 230 235
summer concert *picture* P 86d
Granville John Carteret first Earl (1690–1763) English statesman popular with the Hanovers but opponent of Walpole very successful as ambassador to Sweden and as lord lieutenant of Ireland after downfall of Walpole was for two years in control of foreign affairs brilliant diplomat and orator
Granville Barker Harley Granville (1877 1946) English playwright producer and writer on theater thoughtful skillful unromantic dramas (The Voysey Inheritance "The Madras House Waste His Majesty) actor at 14 with his wife Helen translated from Spanish plays of G Martinez Sierra and Brothers Quintero
Grape anhid or phylloxera, an insect parasite G 155 156
Grape family or Vitaceae (*vī tā' sē ē*) a family of plants and shrubs including the grapes Virginia creeper Boston ivy marine ivy and ampelopsis
Grapefruit or pomelo a citrus fruit G 154 *pictures* F 152 G 154 *color pictures* I 34b F 309 U 273
farm *picture* A 355 *color picture* F 34b
Florida F 151 G 154
Grapes G 155–6 *pictures* G 155–6 *color picture* F 310
alcohol from A 146
currants C 530
diseases and pests mildew M 248 phylloxera G 155 156
Europe France G 155–6 *picture* F 263 Germany *picture* G 91 Portugal P 379, Spain S 318 *picture* S 315
food value G 156
harvesting *picture* G 91
improvement of varieties A 63 G 155
propagation methods G 158
raisins R 72
seeds 3000 years old G 156
sour grapes familiar saying F 3
tartaric acid from T 20
United States G 155–6
Grapeshot artillery projectile A 400
Grape sugar or dextrose the commonest of the monosaccharide sugars same as glucose S 446 G 127
polariscope test L 235
Graph or chart a diagram showing comparison of related numerical facts G 157–66 *graphs* G 157 65
absolute vs relative gain G 164–5 *charts* G 165
bar chart G 158–9 161–2 *charts* G 158 161
books about G 166
flow chart G 166
frequency distribution S 385d–e, G 163 *graphs* S 385d–e, G 163–4
frequency polygon G 163–4, S 385d *graphs* G 163–4 S 385d
functions shown by C 18e
histogram G 163 S 385d, *chart* G 163 *graph* S 385d
how to make G 157–8
index numbers L 279 P 146 *graph* L 279
line G 160–1 162–3, *graphs* G 160, 162–3
ogive G 164 *graph* G 164
organization chart G 166
pictorial G 158 161 *charts* G 158, 161
pie graph A 157 *graph* A 157
ratio chart G 164–6 *chart* G 165
relationships G 162–3 *graphs* G 162
terms of graph G 157
Graphic arts A 400j k
Graphite (*grā' fīt*) or plumbago (*plum bā' gō*) a soft black form of (*crystal*)*line carbon* G 156
atomic power moderator *diagram* A 468
electrotyping F 321
lead in pencils P 116–17 *picture* P 116
Graptolite invertebrate of Paleozoic era G 59 *picture* G 52
Grasmere England a picturesque village in Westmorland near lake of same name pop 988 famous as a haven for poets and author's home of Wordsworth *map* B 325
Grasse (*gras*) **François J P comte de** (1722–88) French admiral commanded French fleet in operations before Yorktown in American Revolut on R 129
Grasse France 18 mi w of Nice pop 13 31 winter resort marble quarries manufactures soap and fine olive oil
perfume industry P 147
Grasser (*gras' ĕr*) **Erasmus** (1450?–after 1 26) German wood engraver architect and sculptor
statue of dancer *picture* W 190b
Grasses f 166–7
blue eyed grass *color picture* F 172
distinguished from sedges S 95
flood prevention F 146
hay yielding types H 295
leaf veins *picture* L 152
origin G 59–60
rainfall affects growth C 350
used for lawns G 15
Grass family or Gramineae (*grə mĭn' ē ē*) a family of plants distributed over the world including the cereals sugarcane sorghum bamboo forage hay and pasture grasses lawn and ornamental grasses most valuable to man of all the plants G 166–7
Grasshopper G 167–8b *pictures* G 167–8b A 250b *color picture* I 154a
control measures G 168a b
ears G 168
eggs G 168 *picture* E 289 egg laying G 168 *picture* G 168
eye *picture* E 461
metamorphosis G 168a *pictures* G 168 I 156
most destructive species G 168b
myth of Aurora and Tithonus A 473
principal parts *diagram* I 152
voice where located G 168
western *See in Index* Mormon cricket
Grasshopper constitution in Nebraska N 106
Grasshopper mouse M 441
Grasshopper sparrow S 328
Grassi (*gräs sē*) **Giovanni Battista** (1854–1925) Italian zoologist studied especially the mosquito and malaria and the life and habits of termites and eels
Grass Lake Ill near Illinois Wisconsin line noted for lotus L 317
Grasslands G 168b–70, *map* G 169, *pictures* G 170
soils of G 169
Grass pickerel P 256
Grass rugs P 252
Grass snake a garter snake so called because it lives in the grass *eggs picture* E 289
Grass sponge S 254
Grasswort starry *See in Index* Cerastium
Gratiano (*grā shĭ ā' nō*) in Shakespeare's Merchant of Venice M 173
Graticule (*grăt' ĭ kūl*) of map M 84
Grattan (*grăt' ăn*) **Henry** (1746–1820) Irish patriot orator and statesman opposed parliamentary union of Ireland with Great Britain but accepted accomplished fact in British Parliament 1805 till death strove for Catholic emancipation conspicuous for probity of his character no less than for his ability
Gratz Austria *See in Index* Graz
Grau San Martín Ramón (*grou sän mär tēn' rä mōn'*) (born 1887) Cuban statesman physician provisional president of Cuba 1933–34 president 1944 48 advanced labor and agrarian reforms
Grave in music *See in Index* Music *table* of musical terms and forms
Gravel S 227
Gravelines (*grăv' lēn'*) France fortified seaport on Aa River 10 mi sw of Dunkirk fisheries shipping shipbuilding here Spanish troops in 1558 defeated French
Gravelotte (*grä lŏt'*) France village 7 mi w of Metz defeat (Aug 18 1870) of French under Bazaine by Prussians under Crown Prince Frederick (also called Battle of Rezonville) led to siege of Metz
cavalry charge *picture* F 268
Graver or burin an engraving tool E 386
Graves Alfred Perceval (1846 1931) Irish poet born Dublin in Irish musical and literary renaissance popularized folk melodies best known for ballad Father O Flynn
Graves Morris (Cole) (born 1910) painter born Fox Valley Linn County Ore works fanciful and mysterious typically with a line design on a dark ground symbolic birds a favorite subject
Bird Singing in the Moonlight P 35 *picture* P 35
Graves Robert R (born 1895) English writer born London son of Alfred P Graves his more than 50 works include poetry (Collected Poems and No More Ghosts) autobiography (Goodbye to All That and But It Still Goes On) criticism (On English Poetry) and historical novels (I Claudius and Sergeant Lamb's America)
Graves Thomas Lord (1725?–1802) rear admiral of British fleet in American Revolution defeated by French fleet under De Grasse 1781 made admiral 1794 took part in Lord Richard Howe's victory over French off Ushant
Gravesend (*grāvz' ĕnd'*) England port on Thames River 22 mi se of London pop 45 043 favorite resort for Londoners *map* B 325
Pocahontas buried here P 331
Gravitation G 170–3 *pictures* G 171–2
comets controlled by C 420

Einstein s explanation R-100
falling bodies law of G-171
Galileo's experiment with falling bodies G-171, *picture* G-171
in rocket ship on trip to moon D-101, S-310
law of G-173, P-230
measured by pendulum P-118
meteorites drawn to earth by M-180
moon, gravitational force on M-384
Newton discovers law N-193
sun's attraction and force S-452
tides caused by T-129–30, *diagram* T-130
water cycle part played in W-61–2, *diagrams* C-453, W-61
weight affected by M-142*d*

Gravitom'eter, a device for measuring specific gravity
petroleum use in locating P-170

Gravity, G-170–3, *pictures* G-171–2. *See also in Index* Gravitation

Gravity, center of G-173
how to find in triangular figure *pictures* M-159
support and M-158–9, *pictures* M-160

Gravity, specific G-173 *See also in Index* Specific gravity

Gravure printing P-414*a* P-210*c*
color engravings P-210*d*

Gray, Asa (1810–88) botanist born Paris N Y , co-operated with Darwin, professor of natural history Harvard University prolific writer on botany, his manual of botany much used by students
Hall of Fame, *table* H-249

Gray, Elisha (1835–1901) inventor born Barnesville Belmont County Ohio, perfected telegraphic devices, invented telautograph
telephone B-122

Gray, Elizabeth Janet (Mrs Morgan Vining) (born 1902) author born Philadelphia Pa of Quaker ancestry, books for children 'Jane Hope', 'Penn', 'Adam of the Road awarded Newbery medal 1943 Her experiences as tutor, 1946–50 of Akihito, crown prince of Japan are told in her book 'Windows for the Crown Prince'

Gray, George (1840–1925) jurist and legislator born New Castle Del , U S senator (Democratic) 1885–99, stanch supporter of President Cleveland U S Circuit Court Judge 1899–1914

Gray, Gordon (born 1909) lawyer, newspaper owner, born Baltimore, Md , appointed assistant secretary of army Sept 1947, secretary of army 1949–50, elected president University of North Carolina 1950

Gray, Hawthorne C. (1889–1927), American Army officer (captain) and aeronaut
balloon ascensions B-36

Gray, Robert (1755–1806), navigator, born near Tiverton, R I , Navy officer during Revolution, master of *Columbia*, first ship to carry American flag around world, sent by Boston merchants to trade for furs with Indians on Pacific coast
Columbia River named by C-416, O-410

Gray, Stephen (1696–1736), English electrician, discovered electric properties of many substances. E-307

Gray, Thomas (1716–71), English poet, rebelled against classicism; great student and possessed vast knowledge of classical authors, painting, architecture and botany; his greatest poem 'Elegy Written in a Country Churchyard', made him one of the immortals of English literature E-378*b*

Gray, a color C-392, 394
color intensity lowered by, *color chart* C-393

Gra-Y, clubs for boys Y-342

Gray birch, or white birch B 155

Gray fir. *See in Index* Western hemlock

Grayfish. *See in Index* Dogfish

Gray fox F-253–4
scientific name F-254

Gray Friars. *See in Index* Franciscans

Gray goods, woven or knitted fabrics which have not been processed into finished cloth

Gray-headed coneflower. *See in Index* Lepachys

Gray Lady, member of hospital and recreation corps of the American National Red Cross under professional supervision gray ladies provide services for the sick in military and civilian hospitals R-87*b*, *picture* R-87*b*

Graylag, a wild goose G-140

Grayling, a fish allied to the trouts T-193

Gray matter, of nervous system N-110, *picture* N-112
brain *See in Index* Cortex of brain

Gray Monks. *See in Index* Cistercians

Gray sea eagle E-168

Gray seal animal S-90, *picture* S 89

Grays Harbor, an inlet of the Pacific, w coast of Washington *maps* W-37, 44

Grayson, David *See in Index* Baker Ray Stannard

Gray squirrel S-359*a–b*, *pictures* S-359, 359*b*

Gray wolf *See in Index* Timber wolf

Graz, or **Gratz** (*grats*) city in Austria 140 mi s w of Vienna pop 226-453, iron and steel university and technical schools medieval buildings A-494, *maps* E 416, 425, B-23

Graziani (*grä-tsyä'ne*) **Rodolfo** (1882–1955), Italian marshal born 50 mi s e of Rome viceroy of Ethiopia 1936–37 commander Italian forces in Africa and governor general Libya 1940–41 defense minister Mussolini s puppet regime 1943–45; found guilty of treason 1950, later released

Grazing land. *See in Index* Pasture lands

Greaser, nickname for Mexican N-235

Greasewood, a spiny shrub (*Sarcobatus vermiculatis*) of the goosefoot family with fleshy leaves common in Rocky Mt region grows in alkaline and saline soils; used as indicator of salty soil farmers avoid land where it is abundant

Great American Desert U-291, F-38
cattle boom C-154
settlement F-39, C-148

Great Appalachian Valley, or **Great Valley** A-276, U-251, 270, *diagram* A-276

Great anteater A-261–2

Great Atlantic & Pacific Tea Company, The, a retail food chain store company, established as tea stores by George F Gilman (1826–1901), a hide and leather merchant, and George H Hartford (1833–1917), an employee who conceived the profitable method of merchandizing tea and became partner and manager 1878, Hartford's sons, George L (born 1864) and John A (1872–1951), continued management of the business C-181

Great auk, extinct bird A-473, B-193

Great Australian Bight *maps* A-488, 478

Great Barrier Reef, off n e coast of Australia, longest coral reef in world (1200 mi) A-476, C-478, *maps* A-489, 478, *pictures* C-477

Great Basin, region in w U S about 200 000 sq mi between Sierra Nevada and Wasatch Mts U-299, *diagram* A-244, *maps* U-250, 256, N-245, C-414*b*
desert *map* D-73*a*
Nevada N-124
Utah U-408, *map* U-410

Great Bear, or Ursa Major, a constellation containing the Big Dipper *charts* S-374, 376–7, 379–80
Big Dipper used in telling time and direction *diagrams* A-429
circumpolar stars A-436

Great Bear Lake, in Northwest Territories Canada, 12 000 sq mi M-15, *maps* C-68, 80, N-245
radium and uranium C-88, *picture* M-271 mill, *picture* U-405
size comparative *See in Index* Lakes *table*

Great Belt, Denmark strait separating Funen and Zealand *map* D-71

Great Bend, Kan town on Arkansas River 92 mi n w of Wichita; pop 12 665 oil wells nearby, wheat shipping center *map* K-10

Great Bible B-135

Great black-backed gull G-231

Great blue heron H 350 *picture* H-349, *color picture* B-180

Great Books Program, term applied to study by adults of present-day problems through reading and group discussion of classics of Western World, program organized by John Erskine for American soldiers in Europe after World War I, later developed at Columbia University University of Chicago, and St John s College, great books programs for adults introduced in New York 1927, and Highland Park, Ill 1930, Great Books Foundation, a nonprofit organization, established at Chicago 1947 to help organize groups throughout country

Great Britain, or Britain, political union comprising England Wales and Scotland, 88 745 sq mi , pop 48 840,893, including Isle of Man and Channel Islands 89,041 sq mi pop 48 998 882 The term Great Britain or Britain is often used for United Kingdom of Great Britain and Northern Ireland *See also in Index* British Isles
flag F-136*c*, *color picture* F-133
relationships to continent *maps* E-416–17, 419–20, 429, 429*d*
size comparative *See in Index* Islands, *table*

Great Britain and Northern Ireland, United Kingdom of, kingdom comprising all territory of British Isles (except Republic of Ireland) and the Channel Islands, 94 279 sq mi pop 50,369,591 G-173–8, B-320, *maps* B-321, 324–5, E-416, *pictures* G-173–4, *Reference-Outline* G-174–7. *See also in Index* British Commonwealth and Empire, British Isles, England, England history of, Great Britain, Scotland Wales
flag F-136*c*, *color picture* F-133
population, *graph* P-371: birth and death rates *graph* P-372; density, *map* P-371
relationships to continent, *maps* E-416–17, 419–20, 429, 429*d*

Great Central Valley, of California *See in Index* Great Valley

Great Charter M-41. *See also in Index* Magna Carta

Great circle, of the globe, *maps* M-88
airways, *map* A-531
in navigation N-76, *diagrams* N-76

Great Commoner, William Pitt, earl of Chatham C-198

Great Council, in England P-88

Great Dakota Boom S-306

Great Dane, dog *pictures* D-116*c*, *color picture* D-116, *table* D 118*a*

Great Dismal Swamp *See in Index* Dismal Swamp
Great Divide *See in Index* Continental Divide
Great Dividing Range Australia A 478 *maps* A 469 478
Great Dog or **Canis Major** a constellation *charts* S 373 379 381
Great Eastern ship *picture* S 150 used as cable layer C 8
Great Egg River or **Great Egg Harbor River** in s New Jersey flows se about 80 mi to Atlantic Ocean *maps* N 156 165
Great Elector *See in Index* Frederick William
Greater Antilles western islands of West Indies 91 000 sq mi pop 14 686 446 W 93 *maps* W 96 98 N 245
Greater East Asia Japanese name for area of Far East which Japan undertook to dominate P 14 J 301
Greater London England pop 8 348 177 I 299
cities world's largest *See in Index* City *table*
Greater New York N 226
Greater Paris France pop 4 7 5 711 P 82–3
Great Expectations novel by Charles Dickens in childhood Pip (Philip Pirrip) the hero befriends a escaped convict who later provides for Pip to be educated as a gentleman of great expectations
Great Falls Montana city on Missouri River about 70 mi ne of Helena pop 39 214 hydroelectric power copper and zinc refining copper wire railroad shops food processing College of Great Falls M 377 378 *maps* M 374 U 302
Great Falls College of at Great Falls *Mont Roman Catholic* founded 1932 arts and sciences business education
Great Falls of the Missouri M 325a Lewis and Clark at L 177
Great Falls of the Potomac P 392
Great gray kangaroo K 1 2
Great gray slug a land snail S 204
Great Grimsby England *See in Index* Grimsby
Greathead James Henry (1844–96) British engineer and inventor born Cranbrook Union of South Africa to England 1859 T 210
Greatheart in Bunyan's Pilgrim's Progress guide of Christiana and her children to the Celestial City
Great Horned Owl H 428a *pictures* H 428b *table* H 428e
Great Interregnum *See in Index* Interregnum Great
Great Island site of Colah (Queenstown) Ireland C 372
Great Jury J 366
Great Khingan Mountains Manchuria *See in Index* Khingan
Great Lakes the five lakes (Superior Michigan Huron Erie and Ontario) lying on the borders of Canada and the U S total area nearly 95 000 sq mi G 178 85 *maps* G 179 181 N 245 U 253 *pictures* G 178 180 182–4 *table* U 254 *See also in Index* individual lakes by name and *table* on this page
canals G 181 183 185 C 108b–109 *map* G 179 *See also in Index* New York State Barge Canal Sault Sainte Marie Canals Welland Ship Canal
climate affected by G 180
commerce G 180–3 *map* G 179 *photograph* G 183 *pictures* G 182, C 108a T 170 Buffalo *picture* H 284 copper S 457 Detroit D 75 iron and coal P 123
fisheries F 111 G 184 W 175 S 457
heights and depths, diagram G 179
history G 184 5 La Salle L 104 Canadian U S agreement to demilitarize frontier waters C 89 G 184
Ice Age I 4 C 54 G 184
joint United States Canada use agreed on C 100
level G 180 protection G 184
river system *map* U 257
ships distinctive S 159 *pictures* C 233 G 182 S 50 T 170
tides T 131
Great Lakes Exposition celebration at Cleveland Ohio 1936–37 to commemorate Cleveland's centenary
Great Lakes St Lawrence Waterway P 157
Great Meadows in Pennsylvania *See in Index* Fort Necessity
Great Miami River *See in Index* Miami River
Great Mogul famous diamond D 80 *picture* D 79
Great National Pike *See in Index* Cumberland Road
Great Northern Clean B 84

FACTS ABOUT THE GREAT LAKES

Lake	Area Sq Mi	Length Miles	Width Miles	Coast Line Miles	Maximum Depth Feet
Superior	31 8 0	350	160	2 1 0	1 2 0
Huron	23 0 0	20	183	2 3 0	750
Michigan	22 400	307	118	1 3 0	923
Erie	9 9 0	241	57	800	210
Ontario	7 5 0	193	53	1 100	774

Great Northern Railroad
James J Hill builder H 305
T Roosevelt breaks merger R 223
Great organ O 424
Great Pacificator Henry Clay C 341
Great Paul bell B 121
Great Plague London England B 203 *See also in Index* Bubonic plague
Great Plains region in central U S U 251 253 291–3 *maps* U 250 278 9 286 7 296 7 N 245 *Reference Outline* U 336b 8 *See also in Index* United States *subhead* geographic regions *also* names of states in Great Plains region
Great Powers *See in Index* Powers the Great
Great primer type T 228
Great pyramids of Gizeh Egypt P 446 *pictures* E 278a P 446 S 105
Great Pyrenees dog *table* D 118b
Great Rebellion England (1642 49) *See in Index* Civil War (England)
Great Rift Valley in Africa A 37 E 198
Great Russia division of old Russian Empire included *all Russia in* Europe
Great Russians R 262 S 198
language R 294
Great St Bernard Pass famous Alpine pass *(8100 ft) connecting* Rhone Valley with Aosta Italy monastery at A 180
Great Salt Lake in nw Utah average area 2000 sq mi G 185 U 409 D-73a *maps* U 410 416 U 296 N 245
discovery U 409
Lucin cutoff *picture* U 419
Great Salt Lake Desert Utah U 408 U 299 *maps* U 296 U 416, 410
Great Sand Dunes National Monument in Colorado N 35 *map* N 18
Great Sandy Desert Western Australia *maps* A 488 477–8 D 73a
Great Schism (*sĭz'm*) East final division between Roman and Greek Catholic churches (1054) C 302
West division in Roman Catholic church (1378–1417) between two factions each of which supported its own pope U 406 H 452
Great screw mollusk shell *See in Index* Gimlet tower
Great Seal *See in Index* Seal Great
Great Serpent Mound Ohio M 438
Great Slave Lake in Canada n of province of Alberta about 11 170 sq mi M 15 *maps* C 80 1 N 245 explored C 96
land C 76
size comparative *See in Index* Lakes *table*
Great Smoky Mountains a range of *Appalachians on border of North* Carolina and Tennessee A 276 *maps* T 59 N 268 L 275
Great Smoky Mountains National Park in N Carolina and Tennessee G 188–7 N 19 35 *pictures* G 186 *color picture* N 19 *maps* N 18 T 67 N 274
Blue Ridge Parkway N 38c R 182
Great Southern Ocean *See in Index* Antarctic Ocean
Great Stone Face rock formation in New Hampshire N 143
Great Systems of the Universe book by Galileo G 5
Great Tom bell B 121
Great Train Robbery motion picture M 432 *picture* M 434
Great Trek S 244 B 219
Great Valley also called Central Valley or Great Central Valley of California C 26 37 38 39 U 302 *map* U 303 *pictures* C 37 39
Central Valley Project C 39 *picture* C 38 Millerton Lake National Recreation Area N 38 *map* N 18
climate C 38
hydroelectric power *map* W 70
Great Valley *See in Index* Great Appalachian Valley
Great Victoria Desert Western Australia *maps* A 488 478 D 73a
Great Wall of China C 277 *maps* C 259 M 343 *picture* C 282
Great Wall of Peru S 263 *picture* S 278
Great Western *an early steamship* S 152
Great Whale River in w Quebec flows 360 mi w to Hudson Bay *maps* C 69 72
Great white heron H 351
Great white shark or **man eater** S 134, *picture* S 134
Great White Way Broadway street in New York City E 314 *picture* N 220
Great willow herb *See in Index* Fireweed
Great Yarmouth (*yar'm ŭth*) often Yarmouth port and watering place on e coast of England 121 mi ne of London pop 51 105 herring fisheries (Yarmouth bloaters) *map* B 325
Greave armor for the leg below the knee A 376 377
Greaves Captain 17th century West Indian pirate born in Barbados of English prisoner slaves renowned for humane treatment of victims ended career as plantation owner *and philanthropist*
Grebes diving birds G 187 *picture* G 187
foot *picture* B 175
pied billed *color picture* B 179 *nest, picture* B 173
Gretchaninov Alexander T *See in Index* Gretchaninov
Greco El (*ĕl grĕk ō*) (The Greek) name given to Domenico Theoto

cópuli (*thā-ō-tō-kō-pō'lē*) (1541?–1614), Cretan-Spanish painter, born Crete; figures generally elongated; although his predominant color is often grayish and seemingly lifeless he attained high dramatic effects by a skillful use of light and by areas of rich and glowing color; vision, intense emotion, and sincerity in his works; in later years religious mysticism was a dominant force in his art ('The Burial of the Count Orgaz'; 'The Disrobing of Christ'): P-27*b*
'The Assumption of the Virgin' P-27*b*, *color picture* P-27*c*
Greece, kingdom in s e Europe occupying s. part of Balkan Peninsula; about 51,000 sq. mi., pop. 7,631,124; cap Athens: G-188–96, *maps* G-189, B-23, E-417, *pictures* G-188, 190–5
agriculture G-189–90, *pictures* G-191–2: farm life G-190, *pictures* G-191–2, 194
Athens A-447, 449
cities, *list* G-188
Athens A-447–9, *pictures* A-447–8, *maps* A-448
Salonika S-29
climate G-189
clothing, *pictures* G-192, 194
commerce: exports and imports, G-191, *see also in Index* Trade, *table*; ships, tonnage S-161
Corinth C-478
Crete C-510–11, *picture* C-510
doll, *color picture* D-122*c*
earthquake in Ionian Islands E-197
flag F-136*b*, *color picture* F-132
government G-194–6
history G-191, 193–6
independence won (Peace of Adrianople) G-191: Byron aids B-373
Balkan wars (1912–13) G-193
World War I W-230, G-193. *See also in Index* World War I, chronology
peace settlement G-193
Venizelos V-446
division of Macedonia M-7–8
war with Turkey W-240, G-193: Smyrna S-203
republic established G-194
dictatorship G-194
George II restored to throne G-195
World War II G-194–5. *See also in Index* World War II, chronology
Italian invasion W-255
German occupation G-194–5, W-255
Crete W-257
Germans withdraw G-195, W-268
monarchy restored G-195
peace treaty awards (1947) G-195
civil war G-195, 196: appeals to United Nations (1946) U-240*b*
United States provides aid to G-196, U-393, T-198
immigration and emigration G-193, I-46
industries G-191
national song N-43
natural features G-188–9, *list* G-188
people G-191: how the people live G-189–91, *pictures* G-188, 191–2; racial classification R-23, *chart* R-22
products G-190, 191, *list* G-188
relationships in continent, *maps* E-416–17, 419–20, 429, 429*d*
religion G-190–1
ships: tonnage S-161
theater D-14*d*
Thrace T-123
woman suffrage G-196
Greece, ancient G-196–202, *maps* A-27, G-197, *pictures* G-198–202, *Reference-Outline* A-240*a–b*
alchemy A-145
Arcadia A-296
architecture *See in Index* Greek architecture
arms and armor, *color picture* S-27: armor A-376, *picture* A-446; sword, *picture* S-484
art. *See in Index* Greek art
astronomy A-443: constellations C-457; knowledge of earth and other planets A-436, 443, E-191, P-448, *pictures* A-428, E-192
Athens A-447–9, *pictures* A-448
athletics O-381–2, *picture* O-379: wrestling W-307
books and bookmaking B-231
book trade B-247
calendar C-22, 23
clothing *See in Index* Clothing, *subhead* Greece, ancient
coal F-313
coins M-292
Corinth C-478
culture contributions to Western civilization W-209–10, C-327, G-210
dance D-14*d*
dolls D-122*c*
education Socratic method C-458
food G-200
furniture F-319*c*
geographic knowledge G-45
government G-197–8: democracy D-63, G-145; international law I-189; Solon's laws S-233; tyrants D-88
hats H-282
history G-196–202, *chart* H-361–3
Aegean civilization A-27–9
Greek invasions G-196, A-29
Homeric Age G-196: Trojan War T-190–1. *See also in Index* Homer
rise of city-states G-197–8, C-324
Persian Wars P-156, 158–9: Marathon M-92; Thermopylae T-117; Salamis S-26, *color picture* S-27
Aristides A-338–9, *picture* G-199
colonies G-197, C-390: Cyrenaica L-219; Sicily S-176
Athenian Empire G-199, A-448–9
Pericles P-149–50
Peloponnesian War G-200–1
Spartan supremacy G-201, S-330
Theban leadership T-115–16, G-201, *picture* T-115
Macedonian rule G-201: Demosthenes D-67; Alexander the Great A-147–8
Ptolemies E-280, P-430, A-150
Hellenistic Age G-201: Alexandria A-150
Roman conquest G-201, R-186
Gothic invasion under Alaric A-129
jewelry J-346
lamps L-88, *pictures* L-89, G-201
language. *See in Index* Greek language
libraries L-181
life and customs G-196–202
literature. *See in Index* Greek literature
mathematics A-2–3: Archimedes A-303–4, *picture* A-304; Euclid and Thales G-60, 65; Pythagoras P-448
medicine M-164*b*: hospitals H-429*b*, H-300
metalworking M-177, 178, *picture* M-177: alchemy A-145
music M-459: orchestra O-405
musical instruments O-424
Olympic Games O-381–2, *picture* O-379
navigation N-79, *picture* N-73
opera, beginnings O-388
people: racial classification, *chart* R-22
philosophy. *See in Index* Greek philosophy
poor laws P-368
puppets P-440
Pythian games A-274
religion and mythology M-476–476*b*, *Reference-Outline* M-478–9: chief gods, origin of R-132, P-405; drama and festivals G-210, D-129–30; oracle at Delphi D-62; rainbow in foretelling events R-70
science S-60–1: alchemy *theories* A-145; Aristotle A-340; chemical knowledge C-220; electricity in amber, *picture* E-293
sculpture *See in Index* Greek art, *subhead* sculpture
shelter S-144*a*, G-200: heating system G-200
ships S-150
slavery S-194–6, G-199
social ideas S-221
Sparta S-328–30, *picture* S-329
sports and games O-381–2, F-230, *picture* O-379
theater T-110, 112, D-14*d*: orchestra O-405
Thebes T-115–16
Thrace T-123
time, measurement W-55, L-313
toy horse, *picture* G-201
warfare, tactics W-8
wheel W-120
zoology Z-361
Greek alphabet A-177–8, 179. *See also in Index* Alphabet, *table*
Greek architecture A-305–9
Acropolis A-10–12, *pictures* A-11
arch used in A-297
Corinthian A-306, 309, C-478, *picture* A-308: acanthus leaf as decoration A-7, *picture* A-308
Doric A-306, 309, *pictures* A-308: Parthenon A-12, A-306, *pictures* A-11, *color picture* A-307; Propylaea A-12, *picture* A-11
dwellings G-200
Ionic A-306, 309, *pictures* A-308: Erechtheum A-12; Mausoleum at Halicarnassus S-105; temple of Athena Nike A-12, *picture* A-448
mortar little used in buildings C-166
orders A-306, 309, *pictures* A-308
Parthenon A-12, A-306, *picture* A-11, *color picture* A-307
Pericles' influence P-149
Romans adopt A-309
Greek art G-203–6, *pictures* G-203–4, 206
acanthus leaf as decoration A-7, *picture* A-308
drawing D-140, *pictures* D-140, G-202, P-394
enameling E-341
metalwork M-177, 178
painting G-203, D-140, *picture* G-202
Pericles, influence of P-149
pottery P-393–4, *pictures* P-394: feeding bottle, *picture* G-201; vases G-203, P-394, D-140, *pictures* G-202, D-140, P-398
sculpture G-203–6, S-77, *Reference-Outline* S-85
'Apollo Belvedere', *picture* A-274
'Artemis of Gabii', *picture* E-443
Colossus of Rhodes R-144, S-105, *picture* S-105
'Diana', *picture* E-445
'Discus Thrower', *picture* E-444
Elgin Marbles G-204
'Flora', *picture* E-444
Lysippus H-343
Myron G-204
Parthenon A-12, A-446, *pictures* G-206, E-446, A-11, *color picture* A-307: 'Three Fates', *picture* G-200
Phidias P-187–8, G-204, A-446: 'Athena' A-11, 12, *picture* A-446; 'Zeus' S-105, *picture* S-106
Polyclitus G-204: 'Hera' H-341
Praxiteles G-204–6, S-77, *picture* S-77
relief in Uffizi Gallery, *picture* D-14*d*
Scopas and Lysippus G-206
'The Wrestlers', *picture* E-445

'Venus de Milo G 204 *pictures* E 443 A 273
'Villa Ludovisi Mars *picture* G 204
Greek church *See in Index* Greek Orthodox Church
Greek cross Γ 138b *color picture* F 132
Greek drama. *See in Index* Drama *subhead* Greek
Greek Empire or Eastern Empire B 373–4 *See also in Index* Byzantine Empire
Greek fire
gunpowder G 232 N 91
poison gas C 208
Greek language G 208–9 *picture* G 211
alphabet A 177 S 179 *See also in Index* Alphabet *table*
Bible B 136 137
dialects G 212
English influence on G 208
Latin compared with L 129 30
modern G 208 212 surnames N 25
New Testament B 136
Greek letter societies L 402
Greek literature G 208–12 *pictures* G 208–9 211 *Reference Outline* L 98d
Aesop's fables A 30 F 1 S 414
drama G 210–11 D 129–31 chief writers *list* D 136 modern interpretation *picture* T 113 theaters T 110 112
folk tales S 414 *list* S 422
Hellenistic Age C 212 A 150
historians G 211 212
Homeric epics H 415 G 209 S 414 Trojan Wars T 186 f *picture* T 190 *See also in Index* Homer
Latin influence on L 130
oratory and philosophy G 211–12, R 132–3
poetry G 208–10 212 P 334
preservation B 237
prose G 211–12
Greek mallow *See in Index* Sidalcea
Greek mythology M 476–476b *Reference Outline* M 478–9
collections S 414 *list* S 422
Greek Orthodox church or Eastern Orthodox church C 302 For membership *see in Index* Pelig on *table*
calendar new style accepted C 22
Christmas celebration C 294b–5 298
churches included in R 101
factor in division iconoclasts B 374
marriage *picture M 100 101*
Russia R 272 K 39
Greek philosophy P 204 G 202 G 211–12
alchemy A 145
Aristotle A 339–40 *picture* A 339
Diogenes D 92
Epictetus E 390
logic L 296
Plato P 315
Pythagoras P 448
Socrates S 224–5 *picture* S 225
Greeley Horace *(1811–72)* American journalist G 212–13
Greeley Colo trade center of irrigated region on Cache la Poudre River 50 mi n e of *Denver pop* 20 354 flour canned goods *beet* sugar settled in 1870 by Union *Colony group from* e U S sponsored by Horace Greeley for whom city was named Colorado State College of Education *maps C 409* U 252
Greely Adolphus Washington (1844–1935) soldier and explorer born Newburyport, Mass served in Civil War built cable and telegraph lines in Cuba China Alaska Puerto Rico Philippines Arctic expedition P 350 *map* P 348
Green Anna Katharine (Mrs Charles Rohlfs) (1846–1935) author of detective stories born Brooklyn N Y (Leavenworth Case House *of the Whispering Pines*)
Green Anne (born 1899) author born Savannah Ga sister of Julian Green lived mostly in France (The Selbys The Silent *Duchess Just Before the Dawn*)
Green Henry pen name of Henry Vincent Yorke (born 1905) English manufacturer and novelist from boyhood wrote novels for recreation (*Caught Loving Nothing*)
Green Hetty (1835–1916) financier born New Bedford Mass noted for shrewdness and parsimoniousness believed to be richest woman of her *day in U S*
Green John Richard (1837–83) English historian his *History of the* English People graphic and popular in style (Making of England) *quoted on Washington W 27*
Green Julian (born 1900) American novelist born Paris France of American parents brother of Anne Green writes in French works somber in theme (Avarice House The Closed Garden The Dark Journey)
Green Paul Eliot (born 1894) playwright and novelist, born Lillington N C taught at University of North Carolina Negroes and lowly Southerners a favorite theme (plays In Abraham's Bosom Pulitzer prize 1927 and The Common Glory a Symphonic Drama of American History novel This *Body the Earth short stories* Dog on the Sun essays Dramatic Heritage) *historical pageants P 19a*
Green Thomas Hill (1836–82) English philosopher chief English representative of Neo Hegelian school of philosophy maintained knowledge to be reproduction of eternal mind in human personality theory influenced in some degree political and moral philosophy (Prolegomena to Ethics Lectures on the Principles of Political Obligation)
Green William (1873 1952) labor leader born Coshocton Ohio international secretary treasurer United Mine Workers of America 1912–24 president American Federation of Labor 1924–52 (*'Labor and Democracy*) L 71
Green a color *color chart* C 393
color in fireworks A 158
eye reaction C 400
mixtures C 392 396–9
paint P 41
place in spectrum *color diagram* C 391
plants greenness of *P 295 B 148* L-224a
secondary color *color charts* C 392 398
wave length of light L 233 S 332
Green in golf G 136
Green Amazon parrot *color picture* P 92
Green ash A 401 *table* W 186c
Greenaway Kate (1846–1901) English artist, famous for her quaint and whimsical illustrations for children's books also wrote verse and sketches for own books (Under the *Window* The Birthday Book Mother Goose Little Ann, Kate Greenaway's Almanacs) picture books L-208
Greenback Movement in U S political *history* the movement represented by Greenback party and Greenback Labor party H 298 P 359
Greenbacks U S notes so called because back was printed in green *M 337 339 H 298* approved by Supreme Court U 349
Green Bay an arm of Lake Michigan 120 mi long navigable for largest lake steamers *maps* M 219 W 172–3
La Salle L-104
Marquette M 99
Nicolet W 164
Green Bay Wis port at mouth of Fox River and at head of Green Bay 108 mi n of Milwaukee pop 52 735 large trade in coal lumber fish cheese and grain paper and paper products foundry products machinery canned goods flour much tonnage transshipped up Fox River W 178 *maps* W 173 M 226 *U 253*
Green bee W 52 *color picture* W 61
Greenbrier *See in Index* Smilax
Green bug an aphid A 273
Greene Graham (born 1904) English writer born *Berkhamsted near* London noted for psychological novels (The Man Within The Ministry of Fear The Power and the Glory The Heart of the Matter The Third Man)
Greene Nathanael (1742–86) American Revolutionary War general G 213 R 128b
quoted B 352
Statuary *Hall See in Index* Statuary Hall (Rhode Island) *table*
Greene Robert (1560?–92) English dramatist and poet remembered for a few charming lyrics and a derisive reference to Shakespeare in his Groatsworth of Wit Bought *with a Million of Repentance S 128*
Greenebony a tree *See in Index* Jacaranda
Greeneville Tenn in n e corner on Southern River pop 8721 furniture tobacco flour lumber Tusculum College *map* T 87
home of Andrew Johnson J 358 *national monument N 30 map* N 18
Greenfield Franklin County Mass on Connecticut River 33 mi n of Springfield pop of township 17 *349 tags dies, tools silverware* and paper *map* M 132
Greenfield Village a historic village created by Henry Ford at Dearborn Mich in which the handicraft arts *of the past are represented in their* natural settings F 235 D 28 *See also in Index* Edison Institute
Green gage plum P 322
Green gold a greenish alloy of gold *with silver sometimes with addition* of other metals especially cadmium or zinc used in jewelry G 132
Green heron H 350–1
nest, picture B 173
Green lacewings a group of insects of the order *Neuroptera* family *Chrysopidae* especially the golden eyed lacewing (*Chrysopa oculata*) *color picture I 154c*
eggs *pictures* I 157 E 259
metamorphosis *pictures* I 159
Greenland world's largest island n e *of America almost wholly within Arctic Circle* est mated area 735 000 to 1 250 000 sq mi pop 21 412 cap Godthaab G 213–14 *maps* N 250 P 346 *pictures* G 213–14
Christianity N 297 E 391
Eskimos E 393 397 *picture* E 393
explorations H 437 P 108
icecap G 115 I 4 icebergs from I 8
Northmen E 390 1 G 214 N 296
ocean currents *map* O 335
relationships to continent *maps* N 245–6 248 250–1 258
representation in Danish parliament D 72
runic stone *N 296b*
size comparative *See in Index* Islands *table*

U. S. occupation G-214
weather forecasting G-214, *picture* G-213
Greenland halibut H-248
Greenland right whale. *See in Index* Bowhead
Greenland Sea, in Arctic, *maps* A-238, N-250, W-204–5
Greenland seal S-90
Greenlet, or vireo V-477. *See also in Index* Vireo
Green monkey M-351
Green Mountain Boys V-461
Ethan Allen leads A-169
Green Mountains, range of Appalachian system extending through Vermont; highest peak, Mt. Mansfield (4393 ft.): V-459, *maps* A-276, V-457, N-144, U-259, *picture* U-258
Green Mountain State, popular name for Vermont.
Greenock (*grēn'ŏk*), Scotland, port 20 mi. n.w. of Glasgow; pop. 76,299; shipbuilding: *map* B-324
Greenough (*grĕn'ō*), Horatio (1805–52), sculptor, born Boston; designed Bunker Hill Monument and colossal statue of Washington in Washington, D. C.: S-80
Green pepper P-143
Green plover. *See in Index* Lapwing
Green River, in Kentucky, 350 mi. long; joins the Ohio River s e of Evansville, Ind.: *maps* K-23, 30–1
Green River, rises in Wyoming; unites with Colorado in s.e. Utah; 730 mi. long: C-414*b*, *maps* U-410, 416–17, U-296–7, W-316, 322, C-414*b*, *picture* C-414*a*
Greensand, a clay or sand, colored green by glauconite M-266
New Jersey deposits P-390
Greensboro, N. C., manufacturing city 70 mi. n.w. of Raleigh; pop. 74,389; cotton textiles, rayon textiles, paper cartons, chemicals, brick, hosiery; insurance center; Greensboro College, Woman's College of University of North Carolina, Bennett College, Agricultural and Technical College of North Carolina; named for Nathanael Greene: *maps* N-274, U-253
Greensboro College, at Greensboro, N. C.; Methodist; for women; chartered 1838; opened 1846; arts and sciences.
Greensburg, Pa., center of a coal-mining, coking, and natural-gas region, 26 mi. s e. of Pittsburgh; pop. 16,923; iron, steel, and glass products; Seton Hill College: *map* P-132
Green snail, or green turban, a shell S-139*b*
Green soap S-213
Greenstone. *See in Index* Diabase
Green sunfish S-454
Green tea T-31–2
Green tree snail shell (*Helicostyla viridostriata*), *color picture* S-140
Green turban, or green snail, a shell S-139*b*
Green turtle (*Chelonia mydas*) T-224, *picture* T-223
Greenville, Miss., city, a port on Mississippi River about 95 mi. n.w. of Jackson; pop. 29,936; lumber and paper products, concrete products, rugs, chemicals, cotton and soybean products: *maps* M-302, U-253
Greenville, N. C., city 73 mi. s.e. of Raleigh; pop. 16,724; large tobacco market and warehouses; founded 1786, named for Gen. Nathanael Greene; East Carolina College: *map* N-275
Greenville, Ohio, city in w., 34 mi. n.w. of Dayton; pop. 8859; large gravel-producing plant; scene of Gen. Anthony Wayne's Treaty of Greenville with Indian tribes: *map* O-356
Wayne's treaty with Indians W-77
Greenville, S. C., textile city, cotton market in extreme n.w.; pop. 58,161; Furman University, Bob Jones University: S-284, *maps* S-290, U-253
Greenville, Tex., trade center 50 mi. n.e. of Dallas; pop. 14,727; cotton-growing, agricultural, and horticultural section: *maps* T-90, U-253
Greenville, Treaty of W-77
Greenville College, at Greenville, Ill.; Free Methodist; founded in 1855; arts and sciences, theology.
Green vitriol, sulfate of iron S-448
in ink I-150
Greenway, John C. (1872–1926), soldier and mining engineer, born Huntsville, Ala.; officer in Spanish-American War and World War I; promoted copper mining in Southwest. *See also in Index* Statuary Hall (Arizona), *table*
Greenwich (*grĕn'ĭch, also grĕn'ĭch*), Conn., summer resort 28 mi. n e of New York City; pop. of township, 40,635; founded by Dutch in 1640, scene of battle in Revolutionary War: *map* C-444
Greenwich (*grĭn'ĭj, also grĕn'ĭch*), England, borough of London on Thames; pop. 91,492; naval hospital and college, lies on prime meridian: L-306, *map, inset* B-325
meridian L-133
Royal Observatory. *See in Index* Royal Observatory
Greenwich Civil Time T-137, L-313, *diagram* L-312, *map* T-135
Greenwich (*grĕn'ĭch*) Village, New York City N-219
Greenwood, Arthur (1880–1954), British political leader, born Hunslet, Leeds, England; member Parliament (Labor) after 1922; deputy leader, Labor party, after 1942; lord privy seal 1945–47; paymaster general 1946–47.
Greenwood, Miss., city on Yazoo River 86 mi. n. of Jackson; pop. 18,061; cotton market; cotton products, metal products, drugs: *map* M-302
Greenwood, S. C., city 67 mi. n w. of Columbia; pop. 13,806; textiles, garments; cotton, lumber, machine shop and creamery products; Lander College: *maps* S-290, U-253
Greet, Sir Philip Ben (1857–1936), English actor and manager; presented Shakespeare's plays as done in Elizabethan times.
Gregg, John Robert (*1867–1948*), educator, author, born Ireland, emigrated to U. S. (1893); founder of Gregg system of shorthand; author of books on system: S-166
Gregg shorthand S-166–7, *picture* S-166
Gregor (*grĕg'ẽr*), William (1761–1817), English clergyman and mineralogist, discoverer of titanium.
Gregorian calendar C-22–3, Y-335
Russia adopts R-273
Gregorian chants M-459, G-214
Gregory, the Illuminator, Saint (257?–337?), reputed founder and patron saint of Armenian church; festival October 1: A-374
Gregory, popes. In addition to those below, *see in Index* Popes, *table*
Gregory I, the Great, Saint (540?–604), pope; commemorated as saint March 12: G-214
church music M-459, G-214
sends Augustine to England C-114
Gregory II, Saint (died 731), pope 715–731, born Rome; opposition to Byzantine Empire united Lombards and papacy; commemorated as saint February 11
Saint Boniface and B-228
Gregory VI (died 1047), pope G-214
Gregory VII, Hildebrand (1020–85), pope; *commemorated as saint* May 25: G-214–15, *picture* H-334
investiture conflict H-334–5, G-214–15
Gregory IX (1145?–1241), pope G-215
Gregory XI (1331–78), pope G-215
Gregory XII (1327?–1417), pope G-215
Gregory XIII (1502–85), pope 1572–85 G-215
built Villa Taverna, in Rome R-192
calendar reform C-22, Y-335
Gregory XVI (1765–1846), pope G-215
Gregory, Horace (born 1898), poet and critic, born Milwaukee, Wis.; lecturer, Sarah Lawrence College since 1934 ('Poems, 1930–1940' and 'The Shield of Achilles; Essays on Beliefs in Poetry').
Gregory, Lady Isabella Augusta (1852–1932), Irish dramatist and romance writer, associated with Yeats in Irish literary revival ('Gods and Fighting Men'; 'Irish Folk History Plays'): I-234
Gregory, St., Knights of. *See in Index* Knights of St Gregory
Gregory of Nazian'zus, Saint (329?–389?), churchman whose writings contain best statement of doctrine of Trinity in Greek orthodox theology; a graceful and powerful expounder but not an original thinker; festival May 9.
Gregory of Nyssa, Saint (331?–386?), Greek churchman who anticipated transubstantiation doctrine; constructive thinker, festival March 9.
Gremlins, in folklore, pixies that play tricks; may be devilish or good-humored and beneficent; young called widgets, females fifinellas; first reported by R.A.F. fliers in 1923; name said to be from obsolete English verb *greme*, "to vex."
Grenada (*grē-nā'da*), southernmost of Windward Islands; 120 sq. mi.; pop. 65,618; with s Grenadines (13 sq. mi.), it forms British colony of Grenada (*area 133 sq. mi.; pop.* 72,387); cap. St. George's; cacao, nutmegs, coconuts; health resort: *maps* W-96*a*, N-251
Grenade (*grē-nād'*) (from French *grenade*, "pomegranate"), military weapon; made of steel, containing high explosives, sometimes gas- or flame-producing chemicals; made to be thrown by hand or rifle; used in 17th century; highly developed in World War I: *picture* C-208
Grenadier', originally a soldier whose special duty was to throw hand grenades. As these were picked men, chosen for their boldness and strength, the term came to be applied to members of a special corps.
Grenadine (*grĕn-a-dēn'*), a reddish, sweet syrup made from pomegranate juice.
Grenadine, a silk, cotton, or wool fabric similar to marquisette in weave.
Grenadines, chain of 600 small islands of Windward Islands, British West Indies, stretching for 60 miles between Grenada and St. Vincent, *map* W-96*a*
Grendel, monster slain by Beowulf B-125
Grenfell, Sir Wilfred Thomason (1865–1940), British medical missionary in Labrador G-215, *picture* G-215
Grenoble (*grŭ-nō'blŭ*), France, fortified city on Isère River 60 mi. s.e. of Lyons; pop. 97,287; university: *maps* F-270, I-262, E-425
Grenville, George (1712–70), English statesman; prime minister 1763; secured passage of American Stamp Act, one of causes of American Revolution: R-121
Grenville, Sir Richard (1541?–91), English naval hero; commanded fleet carrying colonists to Roanoke Island in 1585; killed when his ship *Revenge* tried to cut way through

Spanish fleet (read Tennyson's Revenge)

Grenville William Wyndham Baron (1759–1834) English statesman son of George Grenville *as premier* (1807) secured abolition of English slave trade advocated Catholic emancipation

Gresham Sir Thomas (1519?–79) English merchant and royal financial agent founder of Royal Exchange and Gresham's College

Gresham Walter Quinton (1832–95) American jurist and statesman major general in Civil War secretary of treasury 1884 secretary of state 1893 as postmaster general barred all lotteries from mails

Gresham's law in economics principle that bad money drives out good tendency of money having less intrinsic value to displace more valuable money from circulation M 339

Gretchaninoff or **Grechaninov** (*grĕ chu nĕ nŏf*) **Alexandre** (Tikhonovich) (born 1864) American composer born Moscow Russia in U S after 1939 known for songs and Russian church music also wrote operas and symphonies autobiography My Life

Grechaninov Alexandre *See in Index* Gretchaninoff

Gretchen in Faust legends F 46

Grethel Cammer (Frau Viehmännin) old German woman whose stories formed basis of Grimm's fairy tales S 405 G 217 218

Gretna, La industrial city on Mississippi River opposite New Orleans pop 13 813 oil refineries *map inset* L 331

Gretna Green village of Dumfriesshire in S Scotland near English border formerly scene of runaway marriages from England *map* B 324

Greuze (*grŭz*) **Jean Baptiste** (1725–1805) French genre and portrait painter in painting like Pousseau in literature he represents a sentimental return to nature (The Broken Pitcher Innocence)

Greville Charles C F (1794–1865) English public official and diarist whose journals (published 1875–87) contain rich historical material for first half of 19th century

Greville Fulke first **Baron Brooke** *See in Index* Brooke Fulke Greville first Baron

Grevillea (*grĕ vĭl e a*) or **silk oak** a perennial (*Grevillea robusta*) of the protea family native to Australia Used as house plant erect leaves fernlike grows to 70 ft in California and is used as shade tree in Australia attains 150 ft flowers *orange Incuse ers* Lumber elastic durable used in furniture gum resin derived from wood Over 200 species in genus mostly Australian

Grévy (*grā vē*) **Jules** (1807–91) French statesman president of French Republic 1879–87 resigned owing to scandals involving his son in law in traffic in offices and decorations of honor

Grew Joseph Clark (born 1880) diplomat born Boston for many years in U S Foreign Service ambassador to Japan 1932–41 undersecretary of state 1944–45 (Ten Years in Japan 'The Turbulent Era') retired 1945

Grew, Nehemiah (1641–1712) English botanist born parish of Mancetter worked on isolation of chlorophyll cell (The Anatomy of Plants)

Grey Albert Henry George 4th Earl (1851–1917) governor general of Canada 1904–11 stimulated social and economic progress

Grey Charles 2d Earl (1764–1845) English statesman premier 1830–34 Parliamentary Reform Bill R 256

Grey Edward Grey first **Viscount** *See in Index Grey of Fallodon*

Grey Lady Jane (1537–54) nine day queen of England G 215

Grey Zane (1872–1939) novelist, born Zanesville Ohio stories of life in western U S (Desert Gold Riders of the Purple Sage Lone Star Ranger) quoted on New Mexico N 168

Greyhound D 110*b table* D 118*a* Italian greyhound toy dog D 116*c table* D 119 whippet *table* D 118*a*

Greyhound Bus Company B 364

Greylock Mount highest peak in Massachusetts near NW corner of state (3491 ft) *map* M 132

Greymouth (*grē muth*) New Zealand port on W coast of South Island at mouth of Grey River gold coal lumber pop 8865 *maps* I 16 *set* A 489

Grey of Fallodon Edward Grey first Viscount (1862–1933) English Liberal statesman foreign secretary 1905–16 most conspicuous figure in European politics during that decade with Edward VII arranged Triple Entente in 1914 worked to prevent World War I significantly successful in maintaining friendly relations with neutrals during early years of the war raised to peerage 1916 temporary ambassador to U S 1919

Grey Owl (Wa Sha Quon Asin) (1888–1938) Canadian Apache Indian author naturalist built wildlife sanctuary Prince Albert National Park (Pilgrims of the Wild Sajo and the Beaver People) C 87 *picture* N 62

Greysolon Daniel *sieur du Lhut* *See in Index* Du Lhut

Greytown Nicaragua *See in Index* San Juan del Norte

Griboyedov (*grē bo yĕd ŏf*) **Alexander** (1795–1829) Russian dramatic poet and statesman sent to Persia as minister where he was killed by a mob famous for one comedy Misfortune from Intelligence a satirical drama showing Russian manners and social struggle between older and younger generations

Grid of chart G 157 8
arithmetic G 165 *chart* G 165
logarithmic G 165 *chart* G 165

Grid of map M 84

Grid of vacuum tube E 317 F 37 38
diagram E 317
bias R 37
circuit F 37
condenser R 37
leak R 37
screen R 39 *diagrams* R 38

Gridiron a football field so called from its shape F 227

Grieg (*greg*) **Edvard Hagerup** (1843–1907) Norwegian composer G 216, *picture* G 216

Grievance in labor relations L 73

Griffes Charles Tomlinson (1884–1920) composer and pianist born Elmira N Y work impressionistic (Pleasure Dome of Kubla Khan Four Roman Sketches) M 466

Griffin Walter Burley (1876–1937) *American* Australian architect Australian capital planned by C 110

Griffin Ga city 37 mi S of Atlanta pop 13 982 textile and hosiery mills canning plants for pimientos fruits and vegetables U S agricultural experimental station *map* G 76

Griffin a mythical creature half eagle half lion supposed to guard hidden treasure

Griffin La Salle's ship L 104

Griffith Arthur (1872–1922) Irish statesman chief organizer of Sinn Fein president of Irish Free State 1922 I 230*b*

Griffith Darius Wark (1880–1948) motion picture director born La Grange Ky began as stage and motion picture actor became director then producer pioneer in artistic construction of pictures first to place emphasis by cut backs close ups (Birth of a Nation Broken Blossoms silent pictures Abraham Lincoln talking picture) M 432

Griffith Sir Samuel Walker (1845–1920) Australian conservative chief justice of Australia 1903–20

Griffith Earl Los Angeles L 316

Griffon a hunting dog
Brussels toy dog *color picture* D 116*b table* D 119
wire haired pointing *table* D 118

Grignard (*grē nyar*) **Victor** (1871–1936) French chemist born Cherbourg for discovering Grignard's reagent used in synthesizing many organic compounds he shared 1912 Nobel prize in chemistry with Paul Sabatier

Grijalva (*grē hal va*) **Juan de** (1489?–1527) Spanish navigator discoverer of Mexico sailing from Cuba where his uncle Diego Velásquez was governor explored Mexican coast as far as Vera Cruz active in conquest of Nicaragua and Spain there in an Indian outbreak C 488

Grijalva River in states of Tabasco and Chiapas in SE Mexico called Chapas in upper course 300 mi long navigable for 90 miles with Usumacinta *map* M 195

Grillage *See in Index* Architecture *table of terms*

Grille *See in Index* Architecture *table of terms*

Grillparzer (*gril part ser*) **Franz** (1791–1872) Austrian dramatic poet a master of dramatic technique works include classical dramas (The Golden Fleece a trilogy Sappho) historical tragedies and romantic dramas

Grimaldi Joseph (1779–1837) famous English clown Charles Dickens edited his Memoirs

Grimaldi a prehistoric Negroid race whose remains were discovered in S France associated with remains of the Cro Magnon race M 70

Grimes Bryan (1828–80) Confederate soldier born in Pitt County N C major of Fourth North Carolina Regiment in Civil War made major general in 1863 and served in last battles of Lee's army

Grimm Jakob Ludwig Karl (1785–1863) *German scholar founder* with his brother Wilhelm Karl (1786–1859) of science of folklore G 216 18 F 194 *picture* G 216
fairy tales L 271–2 S 411 *pictures* G 217 L 273 S 404 influence on storytelling S 405 G 84 The Bremen Town Musicians S 406*b*

Grimmelshausen (*grim mels hou zen*) **Hans Jakob Christoffel von** (1625?–76) German writer and adventurer served in Thirty Years War 'The Adventurous Simplicissimus realistic adventure story is based on own experiences and written in manner of picaresque novel

Grimsby or **Great Grimsby** seaport on NE coast of England near mouth of Humber River pop 94

527; immense fishing trade; timber, coal trade; shipbuilding history dates from 8th century: *map* B-325

Grimsel Dam, in Switzerland, on Aar River. *See also in Index* Dam, *table*

Grinding machine, a tool T-153. 154
principle of grinding wheel C-178

Grinding tools T-153, 154

Grind of the Navir (Gate of the Giants). Shetland Islands S-148

Grindstone, a circular abrasive stone for grinding edge tools such as ax; made to turn on axle; used dry or with water
cut from Ohio sandstone O-350
emery wheels E-339

Gringo (*grĭng'gō*), nickname for an American N-235

Grinnell', George Bird (1849–1938), writer, ethnologist, and ornithologist, born Brooklyn; editor *Forest and Stream* 1876–1911; founded first Audubon society; author of a number of books on American Indians: S-418

Grinnell, Henry (1799–1874), ship owner, born New Bedford, Mass.; financed Franklin relief expeditions (1850 and 1853–55) and later Arctic explorations; Grinnell Land is named for him.

Grinnell College, at Grinnell, Iowa; established 1846; opened 1848; arts and sciences.

Grinnell Land, Canada, central part of Ellesmere Island, n.w. of Greenland; discovered 1850 by Grinnell expedition.

Griqualand (*grĭ-kwa-länd*) **East**, a native territory of Cape of Good Hope province, Union of South Africa; 6602 sq. mi.; pop 360,775.

Gris (*grēs*), **Juan** (1887–1927), Spanish modernist painter and lithographer, born Madrid; moved to Paris 1905 and became identified with cubist movement.

Grisel'da, figure of romance, famed for her patience
Chaucer heroine. *picture* C-204

Grisi (*grē'sē*), **Carlotta** (1819?–99), Italian ballerina; began career as child; made Paris debut 1840; created role of Giselle in ballet 1841; popular in London where she danced 'Pas de Quatre' with Taglioni, Cerito, and Grahn in 1845: D-14*h*

Grisi, Giulia (1811–69), Italian dramatic soprano, greatest of her day.

Gris-Nez (*grē-nā*), ("gray nose"), Cape, headland of France, point of French coast nearest Britain.

Grison (*grĭ'sŭn*), a weasellike carnivorous mammal of family *Mustelidae* found in Central and South America and Mexico; dark beneath, light above; emits disagreeable odor when it is annoyed; its scientific name is *Galictis*, or *Grison, vittata.*

Grisons (*grē-zôn'*), easternmost and largest canton of Switzerland; 2746 sq. mi.; pop. 136,050; noted for superb Alpine scenery, especially in the Engadine.

Gristle. *See in Index* Cartilage

Gristmill, a mill for grinding grain F-165
granite stones. *picture* F-166
17th-century mill, *picture* A-212

Griswold, Rufus Wilmot (1815–57), editor and author, born Benson, Vt.; in 1850 he helped to edit writings of Edgar Allan Poe, who had named him as his literary executor.

Grits, hominy C-484

Grizzly bear B-85, 86, 88, *picture* B-88, *color picture* N-262
enemy of bison B-200

Grizzly Giant, big tree S-102, Y-341*b*

Groat (*grōt*) (from Dutch *groot*, "big"), name given to English silver four pence, historical value about 8 cents; term once applied to any large, thick coin.

Grodno (*grôd'nŭ*), Russia, formerly **Gardinas** (*gär'dē-nās*), former Polish city, on Niemen River, included in Russia since 1945; pop. 60,000; interesting old buildings; varied manufactures; known for commerce in grain, timber: *map* R-267

Groenendael (*grō'nĕn-däl*), variety of Belgian sheep dog, *table* D-118*a*

Grofé (*grō-fā'*), **Ferde** (Ferdinand Rudolph von Grofé) (born 1892), composer, born New York City; member Los Angeles Symphony Orchestra; pianist and arranger for Paul Whiteman; exponent of "symphonic jazz" ('Mississippi Suite'; 'Grand Canyon Suite'; 'Symphony in Steel').

Grogan, Edward Scott (born 1874), British military officer and explorer, born Winchester, England; traveled through Africa, Australasia, the Americas, in collaboration with Arthur Sharp his traveling companion, wrote 'From the Cape to Cairo'.

Groin, in architecture A-309
vault. *picture* A-316

Grolier (*grō-lē-yā'*), **Jean, vicomte d'Aguisy** (1479–1565), French bibliophile and statesman; ambassador to Rome and Milan and treasurer under Francis I, collected library of 3000 beautifully bound books. Grolier Club a club of book collectors in New York City named for him. B-241
bookbinding B-241, *picture* B-240
book collecting B-246

Grommet. *See in Index* Nautical terms, *table*

Gromwell, a genus (*Lithospermum*) of hairy plants of the borage family found in n hemisphere. Low-growing, hardy; flowers white, yellow, or bluish grow in leafy spikes; seeds small, polished, stonelike, used in rock gardens. Includes the puccoon

Gromyko, Andrei Andreyevich (born 1909), Russian statesman, born near Minsk; ambassador to U.S. 1943–46; permanent U.N delegate 1946–48; deputy foreign minister 1946–49, chief deputy 1949–52 and after 1953; ambassador to England 1952–53.

Groningen (*grō'nĭng-ĕn*, Dutch *krō'-ning-ĕn*), industrial and trade city of n.e. Netherlands; pop 132,021; cattle and grain market; sugar refineries; university (founded 1614): *maps* B-111, G-88, E-424

Groot, Hugo de. *See in Index* Grotius

Groplus, Walter (born 1883), German architect, born Berlin, Germany; in U.S. after 1937; director of Bauhaus, school in Germany (*see in Index* Bauhaus); professor and chairman, Dept. of Architecture, Harvard University 1938–52; exponent of functionalism: favorite building materials glass, metal, and concrete.

Gropper, William (born 1897), painter and illustrator, born New York City; skillful as social satirist; depicts realistically current happenings, such as '*The Last Cow*', a dust-bowl scene.

Gros (*grō*), **Antoine Jean, Baron** (1771–1835), French historical painter; pupil of David; through Josephine was favored by Napoleon and is noted for Napoleonic war scenes; at end of Napoleon's power turned to purely classical subjects; adverse criticism led to suicide.

Grosbeak, various stout-beaked birds of the finch family G-218–19, *picture* G-218
black-headed, *color picture* B-184
food habits B-158
rose-breasted G-218, *color picture* B-184

Groschen (*grō'shĕn*), former Austrian bronze coin worth $.0014; also former German silver coin, worth 2 cents.

Groseilliers (*grō-zĕ-yā'*), **Medard Chouart des** (1621–84?), intrepid French explorer and fur trader, brother-in-law of his companion Radisson
fur trade F-321–3, H-438
Minnesota M-280
Wisconsin W-178

Grosgrain (*grō'grān*), a firm, stiff, closely woven, corded silk.

Gros Michel (*grō mē-shĕl'*), a variety of banana B-46

Gross, numerical unit equaling twelve dozen

Grosse Pointe Park, Mich., village adjoining Detroit on e.; residential suburb, pop. 13,075: *map, inset* M-227

Grosse Pointe Woods, Mich., village 11 mi n e of Detroit; residential suburb; pop. 10,381: *map, inset* M-227

Gross Glockner, highest peak in Hohe Tauern in Tyrol region of Austria; 12 461 ft.: A-494

Gross national product (GNP) I-138, *chart* I-138

Gross tonnage, of ship S-162

Grosswardein, Rumania. *See in Index* Oradea

Grosvenor (*grō'vĕn-ôr*), **Gilbert Hovey** (born 1875), American geographer, born Constantinople (now Istanbul), Turkey; with *National Geographic Magazine* since 1899; editor in chief 1903–54; president National Geographic Society 1920–54.

Gros Ventres (*grō vän'trē*), French name for Hidatsa or Minitari tribe of Plains Indians of Siouan stock on upper Missouri River in North Dakota.

Grosz (*grōs*), **George** (born 1893), American artist, born Berlin, Germany; remarkable caricaturist; first noted as satirical painter, later as painter of nudes, still lifes, landscapes, and various birds.

Grote, George (1794–1871), English historian and banker; his 'History of Greece' is "one of the few great comprehensive histories."

Grotius (*grō'shĭ-ŭs*), **Hugo** (1583–1645), Dutch statesman and jurist, "father of modern science of international law"; tomb at Delft: I-189

Groton (*grŏt'ŭn*), Conn., town on Thames River opposite New London; pop. 7036; U. S. Navy submarine base; site of Fort Griswold, where in 1781, about 800 Tories under Benedict Arnold massacred most of garrison of 150 colonial militiamen: *map* C-445

Grouchy (*grŏo-shē'*), **Emanuel, marquis de** (1766–1847), French marshal, to whose delay at Waterloo Napoleon's defeat is attributed: W-66

Ground, in radio R-35
symbol for, *picture* R-40

Ground bass, in music M-460

Ground beetles, a group of the order *Coleoptera*, family *Carabidae*; especially the fiery searcher (*Calosoma scrutator*), one of the largest beetles; if held carelessly will discharge quantities of "fiery" juice: B-106, *picture* B-105, *color picture* I-154*d*

Ground bumblebee W 52 *color picture* W 51
Ground Controlled Approach R 28 A 534 *diagrams* R 27 *See also in Index* Aviation *table* of terms
Ground crew A 539
Ground cuckoo *See in Index* Road runner
Ground floor *See in Index* Architecture *table* of terms
Ground hemlock Y 339
Ground hog or woodchuck a burrowing rodent G 219 *pictures* G 219 N 55
altitude range *picture* Z 362
hibernation H 352
pet *picture* P 184
Ground hog day (February 2) G 219 F 56
Ground holly wintergreen or checkerberry W 156
Ground ivy I 284
Ground laurel *See in Index* Arbutus trailing
Groundlings in Elizabethan theater S 124
Ground loop *See in Index* Aviation *table* of terms
Groundmass in petrology R 169
Ground nesting termite T 74 76
Groundnut name for peanut and other similar nuts P 104
Ground Observer Corps (Operation Skywatch) a joint activity of U S Air Force and Civil Defense Administration organized 1952 to detect low flying intruder airplanes that cannot be picked up on radar manned by civilian volunteers (about 300 000 in 1954) monitored and supervised by Air Force personnel observation posts and filter centers along e and w coasts and Canadian border silver wings and honor badges awarded for service
Ground pine name given to several species of club mosses (*Lycopodium*) because of their likeness to miniature pine trees used for Christmas decorations P 289 F 54 *See also in Index* Lycopodium
Ground rattlesnake or pigmy rattlesnake R 78
Groundsel a genus of plants of the composite family *See in Index* Senecio
Groundsel common a low growing annual weed (*Senecio vulgaris*) of the family *Compositae* with leafy branching stem leaves pinnate and toothed flower heads yellow also applied to entire genus *Senecio*
Ground squirrel name given to various squirrel like rodents that live on the ground S 359*b*
Ground water source of springs E 181 S 357
Groundwood pulp in papermaking P 66–7 71
Group United States Air Force A 80
Grouper name given to southern members of the sea bass group large voracious fishes with small scales and pale flesh among commonest are Nassau grouper red grouper or mero yellow fin grouper jewfish red hind and rock hind F 104
Nassau grouper *picture* P 420
Group insurance I 167 S 218*a*
Group life *See in Index* Sociology
Grouse G 219–21 *pictures* G 220 *color picture* P 420*a*
courtship G 220 *pictures* B 172 G 220
ruffed grouse state bird *table* B 158
Grout a kind of concrete C 431*a–b* *picture* C 431*b*
Grove Frederick Philip (1872 1948) Canadian novelist, noted for his realism (Settlers of the Marsh Our Daily Bread) C 108*a*
Grove Sir George (1820–1900) English engineer and writer on music erected lighthouses in West Indies director Royal College of Music from its foundation 1882 to 1894 editor in chief Dictionary of Music and Musicians author Beethoven and His Nine Symphonies
Grove Sir William Robert (1811–96) English physicist and judge invented Grove battery author of The Correlation of Physical Forces
Grove City College at Grove City Pa Presbyterian founded 1876 arts and sciences business administration music
Groves Leslie Richard (born 1896) U S Army officer born Albany N Y military director Manhattan Project which developed atomic bomb retired 1948 *table* A 464
Grow Galusha A (1823–1907) political leader born Ashford Conn U S congressman 1851 63 Speaker of House 1861–63 introduced first homestead bill
Growing seasons
Europe *map* E 429
United States *map* U 247
Growth increase in size
bio chemical problem B 148
cell division C 161
child development *See in Index* Child development, *subhead* physical growth
enzymes affect E 388–9 *table* E 389
fish F 101
food factors F 216–17
glands affect H 424–5
life function L 224
plant, promoted P 306–7
rapid in bamboo B 42 grass G 167
trees marked by rings T 179
Growth of the Soil a simple almost plotless novel by Knut Hamsun picturing Norwegian peasant life
Grozny Russia city in n Caucasus pop 172 468 rich oil fields *map* P 967
GR S (Government Rubber Styrene) R 248
Grub larva of beetle B 104
Gruber (*grū ber*) **Franz (Xaver)** (1787 1863) Austrian organist, born Upper Austria known as the composer of Stille Nacht Heilige Nacht (Silent Night, Holy Night)
Grubstreet defined by Dr Johnson J 361
Gruenberg Louis (born 1884) American composer born Russia brought to United States in babyhood developed from pianist into composer chiefly of syncopated impressionistic operas (Emperor Jones Jack and the Beanstalk Enchanted Isle Jazz Suite)
Gruenther (*grun thĕr*) **Alfred M(axwell)** (born 1899) U S Army general born Platte Center Neb chief of staff to Mark W Clark 1943–45 his deputy commander in Austria 1945 47 joint staff director for joint chiefs of staff 1947 49 deputy Army chief of staff for plans 1949 51 became 4 star general July 1951 chief of staff to Dwight D Eisenhower then to Matthew B Ridgway at SHAPE 1951–53 NATO supreme commander 1953–
Gru gru nut edible fruit of the gru gru palm of South America and the West Indies source of valuable oil sometimes used for beads N 317
Gruiformes (*grō i fôr mēz*) an order of marsh birds comprising cranes, limpkins rails gallinules coots
Grundtvig (*grōnt vēg*) **Nikolai Frederik Severin** (1783–1872) Danish poet, philologist and theologian born in Zealand advocated religious and civic freedom collected Danish folk songs (Northern Mythology a study of Old Norse The Decline of Heroic Life in the North a long epic poem)
Danish folk schools D 70
Grundtvig pipe organ church Copenhagen *picture* B 348
Grundy Mrs the personification of society's judgments name originated in old play Speed the Plough where a character asks continually What will Mrs Grundy say?
Grünewald (*grū ne vält*) **Matthias** (1483?–1529?) German painter of late Gothic period powerful color brutal realism strong emotion (the Isenheim altar Crucifixions)
Grunion (*grun yŏn*) small slender fish (*Leuresthes tenuis*) of silverside family (*Atherinidae*) thrives along sandy coasts of California from San Francisco to Lower California F 106
Grunt a large family of food fishes (*Haemulidae*) of tropical seas The name comes from their ability to make a grunting noise
Grus (the Crane) a constellation *chart* S 378
Gruyère (*grū yĕr'*) **cheese** C 207
Gruyères Switzerland picturesque town perched on a high hill 16 mi se of Fribourg pop 1356 famous for its cheeses
Guadalajara (*gwa da la ha ra*) second city of Mexico and capital of Jalisco pop 378 433 275 mi nw of Mexico City center of Mexican steel and glass industries Indian pottery silver mining and farming region health resort severe earthquakes 1875 and 1912 city founded 1531 contains relics of Spanish colonial times university and splendid cathedral M 189 *maps* M 189 194 *picture* M 190
Guadalaviar (*gwä da lä vē yar'*) (Arabic 'white river') also Turia a river in Spain 150 mi long its waters irrigate fertile plain around Valencia and give two most of its water supply *map* E 425
Guadalcanal (*gō od l̇ ka nāl'*) one of the Solomon Is 90 mi long about 20 mi wide chiefly mountainous *See also in Index* Solomon Islands
World War II W 262 287 *map* P 16
Guadalquivir (*gwŏd l̇ ku vēr'*) (Arabic great river) river in Spain 350 mi long rises in e of province of Jaen flows s w through Seville and Córdova into Atlantic Ocean 20 mi n of Cadiz S 108 *maps* S 312 F 425
Guadalupe (*gō od l̇ yp* Spanish *gwa thä lu pā*) Mexican island in Pacific Ocean about 160 mi off coast of Lower California (Baja California) an extinct volcano more than 4000 ft high 15 mi long pop 265 *map* N 251
sea elephants S 90
Guadalupe-Hidalgo (*gwa thä lu pā e thäl gō*) Mexico town 3 mi n of Mexico City where treaty was signed 1848 ending Mexican War
treaty terms M 186
Guadalupe (*gwŏd l̇ yp*) Mountains range in New Mexico and Texas between Rio Grande and Pecos River *maps* N 179 U 297
Carlsbad Caverns National Park C 157 N 31 *color picture* N 22 *map* N 18
Guadalupe Peak or El Capitan highest point in Texas (8751 ft) in Guadalupe Mountains *map inset* T 91 *picture* T 79
Guadalupe River Tex., rises in s w central part and flows s e to point about 20 mi from Gulf of Mexico where it divides one branch unit

ing with San Antonio River, and other emptying directly into San Antonio Bay: *map* T-78

Guadeloupe (*gwäd'l-yp*, French *gwäd-lup'*), French overseas department in West Indies; total area, 688 sq. mi.: pop. 276,464: G-221, *maps* N-251, W-96*a*

Guadiana (*gwä-dē-ä'nä*), a river of Spain and s.e. Portugal; about 500 mi. long, navigable for only 40 mi. from mouth; flows into Gulf of Cadiz: P-378, *maps* S-312, E-425

Guaiac (*gwī'äk*), a resin obtained from the lignum vitae or gaiacum, a tree native to the West Indies and northern South America.

Guaira (*gwī'rä*), or **Guayra, Falls,** at head of navigation, Alto (Upper) Paraná River, between Brazil and Paraguay; the Paraná is about 3 mi. wide at crest of falls and pours over ledge in 18 separate cataracts (highest, 130 ft.), combined average flow of these cataracts is far greater than that of Niagara.

Guaira, La, Venezuela *See in Index* La Guaira

Guam (*gwäm*), island possession of U. S. in w. Pacific 225 sq mi.; pop. 59,498; cap. Agana: G-221, N-82, P-3, 11, *maps* P-16, A-531, W-205
flag F-130*b*, *color picture* F-127

Guan (*gwan*), a turkeylike bird of Central and South America, belonging to the same family as the curassow; it has dark green or black plumage, a long graceful tail, and a throat almost bare and usually with a pendent wattle: one species, called the "chachalaca" from its harsh loud cry, ranges n. through the state of Texas, many of the guans can be tamed.

Guanabacoa (*gwä-nä-bä-kō'ä*), town in Cuba, 6 mi e. of Havana, pop. 112,220, with suburbs; summer resort; medicinal springs· *map* W-96

Guanaco (*gwä-nä'kō*), wild South American ruminant L-285
hide used, *picture* S-259

Guanajuato (*gwä-nä-hwä'tō*), state in central Mexico; rich in silver and other minerals; 11,804 sq. mi.; pop. 1,224,669; cap. Guanajuato: *map* M-194–5

Guanajuato, formerly Santa Fé de Guanajuato, Mexico, historic city 165 mi. n.w. of Mexico City: pop. 23,390; capital of state of Guanajuato; gold and silver; first battle in Mexican war of independence fought here in 1810: *map* M-194–5

Guanchos (*gwän'chōz*), Hamitic people, natives of Canary Islands, originally tall, blond, athletic, but later mixture with Arabs changed these characteristics; by language allied to ancient Numidians.

Guano (*gwä'nō*), a fertilizer formed by the excrement and carcasses of sea birds; composed of phosphoric acid, nitrogen, and potash; name also applied to other manures, such as bat or fish guano
bat B-78
Pacific islands P-12
penguin P-120
Peruvian islands S-276, *picture* S-259

Guantánamo (*gwän-tä'nä-mō*), Cuba, town on Guaso River near head of fine harbor on s. coast; pop. 124,428, with suburbs: *maps* C-528, W-96

Guantánamo Bay, Cuba, U. S. naval base N-82, *map* C-528

Guaporé, Brazil, territory, created 1943 from parts of states of Amazonas and Mato Grosso; area about 98,000 sq. mi.; pop. 37,438; cap. Pôrto Velho: B-291

Guarani (*gwä-rä'nē*), tribe of South American Indians; their descendants form bulk of population of Paraguay and Uruguay, and are important element in Bolivia and Brazil: P-77

Guarani, monetary unit of Paraguay, historical value 33⅓ cents.

Guarantee, in law. *See in Index* Law, *table* of legal terms

Guaranteed annual wage, in labor L-70*a*

Guardafui (*gwär-dä-fwē'*), **Cape,** promontory of Somaliland at entrance to Gulf of Aden; lies n.w. of Ras Hafun, the easternmost point of continent of Africa: *maps* A-46, E-402

Guardi (*gwär'dē*), **Francesco** (1712–93), Italian artist of late Venetian school; Venetian landscapes.

Guardian, in law, name generally given to one who has control of person and property of one under 21 years, also to one who has control of person or property, or both, of one unable to care for himself, as a lunatic, drunkard, etc.

Guarding the Treasure, a game G-88*b*

Guards, Royal Horse, Eng and L-303, *map* L-301, *picture* L-305

Guarini (*gwä-rē'nē*), **Giambattista** (1537–1612), Italian poet, wrote 'Il Pastor Fido', like Tasso's 'Aminta', on which it is patterned it is a lyric conception of the ideal life; identifies happiness with simple rustic life, 'Il Pastor Fido' and 'Aminta' are the finest pastoral poems in Italian literature.

Guarneri (*gwär-nā'rē*), **Guarnie'ri,** or **Guarne'rius,** famous family of Italian violin makers 17th and 18th centuries, of whom most celebrated was **Giuseppe Antonio** (1687–1745) · V-476

Guatemala (*gwä-tä-mä'lä*), republic of Central America; 42,042 sq mi.; pop. 2,788,122; cap. Guatemala City: G-222–222*c*, Y-344, *maps* C-172, N-251, *pictures* G-222–222*c*. *See also in Index* Central America
agriculture of highlands G-222*a–b*
architecture and art, *pictures* G-222*c*, L-115
climate G-222, 222*b*
clothing G-222, 222*a*, *pictures* G-222–222*b*, C-174, L-117
dolls D-122
earthquake of 1917 E-196
education G-222*c*
farm land, *picture* C-173
flag F-138, *color picture* F-136
forced labor G-222*a*, C-174
government G-222*c*
history G-222*c*, C-176
literature L-127
manufactures G-222*b*
marimba players, *picture* L-117
Mayan civilization M-143*a–i*, I-110, G-222*c*: limestone carvings at Piedras Negras S-76, *picture* S-76
natural features G-222, 222*b*, *picture* C-173
people G-222, C-173–8, *pictures* G-222–222*b*, C-174: children, *pictures* G-222*a*, *c*; how the people live G-222*a*
products and resources G-222*a–b*, *picture* B-44
relationships in continent, *maps* N-245–6, 248, 250–1, 258
shelter, *pictures* G-222*a*, *c*, C-174
transportation G-222*b*, *c*

Guatemala City, capital of Guatemala, railroad and commercial center; pop. 284,233; 50 mi. from Pacific coast; textiles; pottery: G-222, *maps* C-172, N-251
earthquake of 1917 E-196

Guatemoc (*gwä-tē'mōk*), also called **Guatemozin** or **Cuauhtemoc** (1495?–1525), last Aztec emperor; nephew of Montezuma II; bravely resisted Spanish but was captured and executed for treason: C-489

Guava (*gwä'vä*), a small fruit grown in tropics F-304

Guayabare (*gwä-vē-ä'rä*) **River,** Colombia, about 650 mi. long, rises in Andes, flows e. to Orinoco River; partly navigable: *maps* C-387, S-252

Guayaquil (*gwī-yä-kēl'*), chief seaport of Ecuador, South America; pop. 258,966; large foreign trade; shipyards: E-232, S-258, *maps* P-164, S-252
temperature E-230

Guayaquil, Gulf of, large inlet of Pacific in Ecuador; over 100 mi. wide at its mouth; narrows into estuary of the Guayas River: E-230, *maps* P-164, S-252

Guayas (*gwī'äs*) **River,** in Ecuador; rises in w. Andes and flows s.w. into Gulf of Guayaquil; partly navigable: E-230

Guaymas (*gwī'mäs*), seaport of Mexico on Gulf of California; railroad connections with U. S.; pop. 18,816: *maps* M-189, 194

Guayule (*gwä-yo'lä*, or *wī-yo'lä*), a perennial shrub (*Parthenium argentatum*) of the aster family G-222*c–d*, *picture* G-222*d*

Gubbio (*gōb'yō*), Italy, pop. 7432; 18 mi. n.w. of Perugia; famous in Renaissance for maiolica ware; still being made.

'Gudrun' (*gōd'ron*), a German epic poem of the Middle Ages, in three parts, full of sea adventures and battles. Gudrun, a princess, is carried away by the king of Normandy and held prisoner for 14 years, when her brother and Herwig, her true lover, rescue her.

Guebers. *See in Index* Ghebers

Guedalla (*gē-däl'lə*), **Philip** (1889–1944), English biographer, historian, and lawyer; combined sparkling, witty style with sound scholarship ('The Second Empire'; 'Conquistador'; 'Gladstone and Palmerston'; 'Bonnet and Shawl'; 'The Hundred Years'; 'Mr. Churchill').

Guelf (*gwelf*), **House of,** Hanoverian rulers of England. *See in Index* Hanover, House of

Guelfs (*gwelfs*) **and Ghibellines** (*gib'e-lēns*), political factions of medieval Germany and Italy G-222*d*
Dante exiled by Guelfs D-14*n*
Florence F-148
Otto IV, a Guelf O-430

Guelph, Ontario, city about 45 mi. w. of Toronto on Speed River; pop. 27,386; Ontario Agricultural College and Macdonald Institute; annual stock show; foundry products, rubber goods, sewing machines, farm machinery, and linen: *maps* C-69, 72

Guemal (*gwä'mal*), also **huemal,** Andean deer D-44

Guenevere. *See in Index* Guinevere

Guenon (*gē-nōn'*), an African monkey; species commonly used by organ grinders and also as pets: M-351

Guéret (*gā-rē'*), France, historic town 38 mi. n.e. of Limoges; 15th-century mansion: *map* F-270

Guericke (*gā'rik-ə*), **Otto von** (1602–86), German physicist; studied law and mathematics in Germany and Holland: E-307

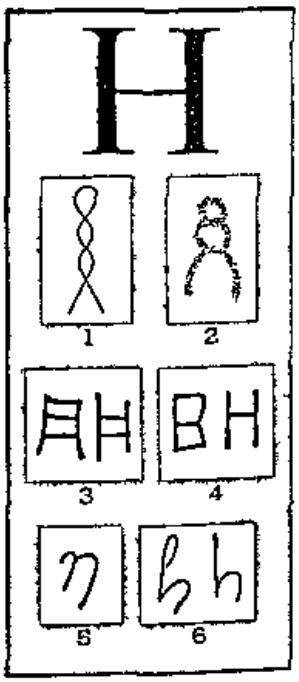
Guérin (*gā-răn'*), **Georges Maurice de** (1810–39), French verse and prose writer; vivid, original style; works colored by intense love of nature
'The Centaur', specimen page, *picture* B-239

Guérin, Jules (1866–1946), painter and illustrator, born St. Louis, Mo.; had charge decorations San Francisco Exposition 1914 (decorations

for Lincoln Memorial Washington D C and Pennsylvania Railroad station, New York City)
Guern Djediane Ras cape (ras) on Mediterranean n Tunisia n w of Bizerte northernmost point of continent of Africa (37° 20 53 n latitude)
Guernsey (gûrn zi) 2d in size of Channel Islands 25 sq mi pop 43 547 St Peter Port nd St Sampson chief towns C 186 *map* D 325
Victor Hugo exiled to H 441
Guernsey dairy breed of cattle C 144 *pictures* A 62 C 141 141b *color picture* M 250d *table* C 142
composition of milk *table* C 143
Guerrara (ga rä ra) Algeria oasis trading center for desert tribes
Guerrero (ga-re rō) Vicente (1782-1831) Mexican revolutionary hero president of Mexico 1829 when forced to retire put up armed resistance but was finally captured and shot M 206
Guerrero Mexico state in s n Pacific 24 885 sq mi pop 915 400 cap Chilpancingo (pop 12 661) c tion tobacco coffee grain textiles bers silver mercury gold iron lead *map* M 194-5
Guerrière (gĕ rĕ ĕr') British frigate in War of 1812 W 13
Guessing Game P 320
Guest Edgar Albert (born 1881) American writer of verse born Birmingham England came to U S 1891 with *Detroit Free Press* since 1895 immensely popular for more serious verse dealing with everyday life also for humorous verse and sketches (Just Folks' When Day Is Done All That Matters)
Guggenheim famous family of American mining capitalists industrialists philanthropists of whom best known are **Benjamin** (1865-1912) **Simon** (1867-1941) U S senator from Colo (1907-13) who established scholarship fund for advanced study abroad in memory of son John Simon **Daniel** (1856-1930) who gave fund for promotion of aeronautics **Harry F** (born 1890) president aeronautics fund ambassador to Cuba 1929-33
Guggenheim Foundation *See in Index* John Simon Guggenheim Memorial Foundation
Guiana (gĕ ä nä) a region in ne South America comprising British Guiana (90 000 sq mi pop 375 701) Surinam also called Dutch Guiana (54 300 sq mi pop 214 000) and French Guiana (34 750 sq mi pop 26 854) G 222d-3 S 270 *maps* G 223 S 252
Raleigh's expedition to R 73
Guiana Highlands region in n South America S 270 *map* S 256
Guided missiles G 224-7 *pictures* G 224-7
bibliography S 310
B 81 *Matador* A 81a *picture* G 224
electronic computers used *picture* C 185
German research G 225-6
parts G 225a b *diagrams* G 225-225a
rocket *See in Index* Rocket
torpedo *See in Index* Torpedo
types G 226-7
U S research G 224-5 226 N 82 A 382
Guidi Tommaso *See in Index* Masaccio
Guido (gwe dō) **of Arezzo** or **Aretinus** (995?-1050?) *Benedictine monk* introduced modern system of music notation M 468
Guido Reni (re nĕ) (1575-1642) Bolognese painter pupil of Calvaert and the Carracci influenced by Caravaggio religious *paintings*
Guienne (gē yĕn') ancient Aquitaine former province of s w France capital Bordeaux *map* F 270
Henry II of England acquires H 335
Hundred Years War H 445 446
Guignol (gē nyol') name given by French to man character in a puppet show also to a puppet or to a *puppet theater*
hand puppet P 441
Guilbert (gēl bĕr') Yvette (1869-1944) a Parisian singer unsurpassed in her day for dramatic and humorous rendition of old ballads
Guild *also gild* G 228 *picture* G 228
apprentice system G 228
booksellers in medieval Paris B 238
Chinese the Co hang C 279
drama of Middle Ages D 131
flags F 122
Florence F 147
Freemasonry F 283
guildhalls *picture* G 228
Middle *Ages R 106 7 M 238g-h*
pinmakers P 257 scribes in B 248
shoemakers S 162
Guilder *See in Index* Florin Gulden
Guildhall old council hall in Cheapside London severely damaged by bombs in World War II *many* statues damaged and wooden figures of Gog and Magog destroyed restoration completed 1954 L 302, *map* L 301
Guild socialism C 427
Guilford College at Guilford College N C founded 1837 by Society of Friends arts and sciences
Guilford Courthouse N C site of battle March 1781 between Greene and Cornwallis 5 mi n w of Greensboro made national military park in 1917
Guillaume (gē yōm') **Charles Édouard** (1861 1938) French physicist inventor of invar 1920 Nobel prize winner in physics
Guillemot (gĭl ĕ-mŏt) a bird of the auk family A 472b-3
egg picture E 269
Guillotine (gĭl ō tēn) French instrument of execution F 293
Guilmant (gēl mäN') **Félix Alexandre** (1837-1911) French organist and composer particularly of works for the organ for more than 30 years organist at church of the Trinity in Paris
Guimarães (gē ma rāĭsh') Portugal town 35 mi n e of Porto birth place of first king of Portugal known also for historical buildings and fortifications *map* E 425
Guinea (gĭn ĭ) coast lands of w Africa from Gambia on n to equator on s in broader sense the coast lands from Gambia to s boundary of Angola
Guinea a former English gold coin so named because gold of which it was coined came from Guinea Coast of w Africa term still used as money unit (21 shillings)
Guinea French *See in Index* French Guinea
Guinea Gulf of on w coast of Africa *maps* A 46 42
Guinea, Portuguese *See in Index* Portuguese Guinea
Guinea Spanish *See in Index* Spanish Guinea
Guinea baboon B 2
Guinea fowl G 228a *picture* G 228a
Guinea grass M 255
Guinea pig or **cavy** (kā vĭ) G 228a *pictures* G 228a V 497
laboratory research animal hamster replacing H 254 vitamin experiments V 497
pets care of P 182b
Guinevere (gwĭn e vēr) in Arthurian romance Arthur's beautiful unfaithful queen R 236
Guiney (gī nĭ) **Louise Imogen** (1861-1920) poet born Boston (The White Sail and Other Poems, Happy Ending)
Guinness (gĭn ĕs) **Alec** (born 1914) English actor born London England roles include Hamlet Herbert Pocket in Great Expectations the Dauphin in G B Shaw's St Joan and psychiatrist in T S Eliot's The Cocktail Party (on Broadway 1950) also starred in motion pictures (eight portrayals in Kind Hearts and Coronets Disraeli in The Mudlark The Promise)
Guis and Robert *See in Index* Robert Guiscard
Guise (gēz) French ducal family branch of house of Lorraine whose heads led extreme Catholic party and aspired to snatch crown from house of Bourbon
Guise Henry duke of (1550-88) le Balafré (the Scarred) incited murder of Coligny and Massacre of St Bartholomew assassinated by order of Henry III of France
Coligny and C 382
Guise Mary of *See in Index* Mary of Guise
Guise France fortified town on Oise River 90 mi n e of Paris pop 5947
Guitar (gĭ tär') a stringed musical *instrument G 228a picture M 471*
Guiteau (gē tō) **Charles** (1840-82) American lawyer assassin of President Garfield G 21
Guiterman (gĭ tĕr măn) **Arthur** (1871-1943) American writer born in Vienna of American parents brought to New York at age of 2 on editorial staff of *Woman's Home Companion Literary Digest* etc author of ballads lyrics humorous verse (Chips of Jade *I Sing the Pioneer* Wild Wood Fables Song and Laughter) wrote libretto of opera Man Without a Country
Guitry (gē trē') **Lucien Germain** (1860-1925) French actor one of greatest French interpreters of modern realistic drama his son Sacha (born 1895) noted as writer of comedies dramatic biographies also as motion picture actor and producer
Guizot (gē zō') **François** (1787-1874) French statesman and historian head of ministry under Louis Philippe (History of Civilization in Europe) L 321
Gulbranssen Trygve (born 1894) Norwegian novelist Beyond Singing the Woods and The Wind from the Mountains chronicles of life on a manor in forests of Norway
Gulden (gŭl dĕn) monetary unit of the former free city of Danzig equal to a 24th part of an English pound sterling and nominally worth about 33 cents also formerly used in Austria and Bavaria (worth when current about 48 and 41 cents respectively) the Dutch guilder is also called gulden
Gules (gūlz) in heraldry H 341
Gulf a sea almost surrounded by land *See in Index* gulfs by name
Gulf Coastal Plain *See in Index Coastal plain subhead Gulf*
Gulf of Mexico *See in Index* Mexico *Gulf of*
Gulf Freeway in Texas T 80
Gulfport Miss city on Mississippi Sound Gulf of Mexico 12 mi w of Biloxi pop 22 659 deepwater harbor resort area shirts forest products pharmaceuticals tung oil fertilizers aluminum pipe food processing Gulf Park College U S

Veterans' hospital: *maps* M-303, U-253
Gulf Stream, a warm-water current flowing from the Florida Straits across the Atlantic to northern Europe G-228*b*, O-335–6, *maps* G-228*b*, O-335
cause of G-228*b*, O-332
fog caused by O-336
Gulfweed, a seaweed with air-bladder floats S-94
Gulick, Luther Halsey (1865–1918), American educator and writer, born Honolulu; organized physical education in Y. W. C. A. and in New York City public schools; editor physical education magazines; with wife founded Camp Fire Girls: C-54
Gull, a long-winged fish-eating bird G-230–1, *pictures* G-231, *color picture* B-179
California gull, state bird, *table* B-158
length of life, average, *pictograph* A-249
Mormon cricket plague G-230, U-410, C-513
Gullet. *See in Index* Esophagus
'Gulliver's Travels', satire by Jonathan Swift, first published in 1726 G-229, S-468, 470, *pictures* G-229
Gullstrand (*gül'strand*), **Allvar** (1862–1930), Swedish ophthalmologist and physicist; won Nobel prize in medicine (1911) for work in optics.
Gull wing, airplane, *picture* A-82. *See also in Index* Aviation, *table* of terms
Gully, small valley E-188
Gum arabic, gum from acacias G-232
Sudan chief source S-442
uses: antidote for phosphorus P-341; candymaking C-112; medieval manuscript ink B-232; photolithography P-210*d*
Gumbinnen (*gum-bin'ĕn*), **battle of** (Aug. 19–20, 1914) W-221, *map* W-222
Gumbo. *See in Index* Okra
Gum camphor C-55
Gumdrops C-112
Gums, substances obtained by drying sap of various plants; distinguished from resins by their solubility in water, but term often applied to resins: G-232
acacia A-4, G-232
amber A-186, *picture* A-186
camphor C-55
chewing C-227
corn C-484
mesquite M-175
perfumes P-148–9
varnish V-439, G-232, P-41
Gum senegal A-4
Gum trees, *pictures* T-180, 182–3
eucalyptus E-412–13, *pictures* A-479, E-412
wood G-232, *table* W-186*c*
Gumwood, wood of various gum trees, much used for furniture G-232
woods known commercially as gum G-232, *table* W-186*c*
Gun (weapon). *See in Index* Artillery; Firearms; Machine gun
Gun bronze. *See in Index* Gun metal
Guncotton, an explosive made by treating cotton with nitric and sulfuric acids E-457–8, C-163, *table* C-162
Gunga Din, in Rudyard Kipling's poem, 'Gunga Din', faithful Hindu water carrier, who dies succoring his master.
Gun-metal leather L-149
Gunn, Jeannie Taylor (Mrs. Aeneas James Gunn) (born 1870), Australian novelist, born Melbourne, Australia ('The Little Black Princess'; 'We of the Never-Never').
Gunnarsson, Gunnar (born 1889), Icelandic novelist; 'Ships in the Sky' and 'The Night and the Dream' are autobiographical.
Gun'nison River, in w. Colorado, rises in Rocky Mts and flows n.w. and joins Colorado River at Grand Junction; waters diverted through Gunnison Tunnel for irrigation purposes· *maps* C-402, 408, C-414*b*
national monument N-30, *map* N-18
Gunnison Tunnel, for irrigation, from Gunnison River e of Montrose, s.w. Colorado, *maps* C-408, C-414*b*
Gunny, coarse sackcloth
jute J-368
Gunpowder G-232–3, *picture* G-232
ammunition A-236–236*b*, *pictures* A-236–236*a*
black powder G-232–3, A-236*a*: bullet, *picture* A-236*a*
China, early use in C-279
explosive force E-457
feudalism ended by F-62
smokeless powder G-233, A-236*a*
Gunpowder Plot, English conspiracy (1605) F-46
Gunpowder tea, *picture* T-29
Gun power, military and naval. *See in Index* Fire power
Gun salutes. *See in Index* Salute, *table*
Gunsaulus (*gun-sg'lus*), **Frank Wakeley** (1856–1921), Congregational clergyman, born Chesterville, Ohio; pastor Central Church, Chicago; president Armour Institute of Technology, Chicago, noted lecturer.
Gunter, Edmund (1581–1626), English mathematician, invented "chain" for land measurement, devised a logarithmic scale (1620) on which slide rule is based.
Gunter chain, used in surveying S-458
Guntersville Dam, in Alabama about 25 mi. s.e. of Huntsville A-118, *map* T-69
Gunther, John (born 1901), journalist, born Chicago, Ill.; represented *Chicago Daily News* in Europe for 12 years; 'Inside Europe', 'Inside Asia', 'Inside Latin America', and 'Inside U.S.A.' are panoramas of events with vivid portraits of leading personages; 'Behind the Curtain' is about Russia; 'Roosevelt in Retrospect'; 'Riddle of MacArthur'; 'Eisenhower; The Man and the Symbol'.
Gunther (*gun'tĕr*), in 'Nibelungenlied', king of Burgundians N-232, S-177
Gunwale. *See in Index* Nautical terms, *table*
Günz (*günts*), a glacial phase I-5
Günz-Mindel, intergiacial period I-5
Guppy, tiny, multicolored fish (*Lebistes reticulatus*); native to Caribbean waters: A-281, P-185, *color picture* F-104–5
Gurgan, Iran. *See in Index* Asterabad
Gurkhas (*gŏr'kăz*), military people of the Rajput race N-110
kukri (sword) S-485, *picture* S-484
Gur'nard, medium-sized fish of the family *Triglidae;* bony-plated head; several detached fin rays used as feelers; family includes the sea robins: F-102
Guru, teacher, particularly of religion in Sumatra S-449
Gus, Uncle. *See in Index* Rey, Hans Augusto
Gusher, a spouting oil well P-172
Lucas gusher P-180
Gusta'vus I, Vasa (1496–1560), king of Sweden, founded Vasa dynasty; made king 1523 by Swedish peasants on expulsion of Danes: S-465
Swedish flag, origin F-136*e*
Gustavus II, Adolphus (1594–1632), king of Sweden G-233–4, S-465–6, *picture* G-233
develops army W-10, G-233
Gustavus Adolphus Day F-59
Gustavus III (1746–92), king of Sweden 1771–92; by a bloodless revolution, regained regal powers lost by his predecessors; instituted needed reforms, but was assassinated through conspiracy of nobles; wrote excellent historical essays.
Gustavus IV (1778–1837), king of Sweden 1792–1809; son of above; his violent hatred for Napoleon led him into coalition against French and into disastrous war with Russia; his subjects, convinced he was insane, dethroned him and denied crown to his descendants; died in poverty in Switzerland.
Gustavus V (1858–1950), king of Sweden 1907–50; succeeded father, Oscar II: S-466
Gustavus VI, Adolphus (born 1882), king of Sweden; great-great-grandson of Napoleon's marshal, Jean Baptiste Jules Bernadotte, who founded present reigning house in 1810; succeeded father, Gustavus V (Oct. 1950).
Gustavus Adolphus College, at St. Peter, Minn.; Lutheran; founded 1862; arts and sciences.
Gutenberg (*gū'tĕn-bĕrg*), **Johann** (1400?–1468), German inventor, traditional inventor of printing from movable type: G-234–5, P-414*d*, *pictures* G-234, I-202
Frankfort honors F-279
press, *picture* G-234
Gutenberg Bible. *See in Index* Forty-two-line Bible
Guthrie (*güth'ri*), **A(lfred) B(ertram)** (born 1901), writer, born Bedford, Ind.; known for novels of the West ('The Big Sky'; 'The Way West', Pulitzer prize 1950).
Guthrie, Samuel (1782–1848), chemist, born Brimfield, Mass.; first to produce percussion powder successfully; invented punch-lock process for converting potato starch into sugar; one of three independent inventors of chloroform.
Guthrie, Thomas Anstey (1856–1934) (pseudonym F. Anstey), English novelist, born London; stories humorous and fanciful ('Vice Versa', satirical novel; 'A Long Retrospect', autobiography).
Guthrie, Okla., city 30 mi. n. of Oklahoma City, on Cimarron River; pop. 10,113; in agricultural and oil region; cotton mill, iron foundry, railroad shops; Catholic College of Oklahoma for Women: *maps* O-371, U-252–3
Guthrum (*gŏth'rom*) (died 890), Danish chief, king of East Anglia
Alfred defeats A-152
Gutiérrez (*gō-tē-yā'răth*), **Antonio García** (1813–84), Spanish dramatist of romantic school.
Gutiérrez (*gō-tē-yā'rās*), **de Lara, Bernardo** (1778–1814), Mexican patriot, born Quanajuato; led filibustering expedition into Texas with Augustus W Magee (1812–14).
Guts Muths (*gŭts' mŭts*), **Johann Christoph Friedrich** (1759–1839), educator, born Quedlinburg, Prussia; founder of German system of school gymnastics.
Gutta-percha, gummy substance resembling rubber G-235
Gutzkow (*gŭts'kō*), **Karl Ferdinand** (1811–78), German dramatist and novelist; a leader in "Young Germany" school, revolting against all traditions ('Uriel Acosta'; 'Die Ritter vom Geiste').
Guy'andot River, rises in s.w. W. Va. and flows n.w. 150 mi. to Ohio River, *maps* W-100, 106
Guy Fawkes Day (November 5) F-46

( ) Mannering novel by Sir Walter Scott S 69
Guynemer (*gēn mĕr'*) **Georges** (1894–1917) French aviator brought down more than 50 enemy machines before his death
Guyot (*gē yō*) **Arnold Henry** (1807 84) Swiss American naturalist geographer and geologist profes sor of physical geography and geog raphy Princeton University *after* 1854 friend of Louis Agassiz his meteorological observation led to establishment of U S weather bureau (Earth and Man Mete orological and Physical Tables)
Guyot Mount peak of Great Smoky Mts on North Carolina Tennessee *border* (6621 *ft*) *map* T 87
Guzmán Blanco Antonio (1829–99) Venezuelan dictat r (1870–90) made self president by revolut on 1870 promote i edu ation and im proved econom c life
Gwalior (*gwa li or*) India ancient city winter cap tal of Madhya *Bharat state previously capital* of independent Gwalior state pop 241 577 s of old city lies new part of Gwalior called **Lashkar** (*lush kŭr*)
Gweduc (*gwē duk*) also **geoduck** (*gē ō-duk*) or **goeduck** (*gwē duk*) a clam C 339
Gwinnett Button (*1732?–77*) signer of Declaration of Independence as Georgia delegate born Eng and killed in duel by Gen Lachlan McIntosh a pol tical opponent signature reproduced D 37
Gwyn or Gwynn Nell (*1650–87*) *Eng* lish actress favorite of Charles II her wit, generosity and kind ness endeared her to the English
Gyges (*gī gēz*) *in Greek* mytho ogy hundred l anded giant flung into Tartarus for warring on gods
Gyges king of Lydia (7th century B C) *possessor according to* leg end of magic ring that made the wearer invisible with its aid he killed the reigning king and usurped his throne
Gymnasium (*gim nā zi um*) a school American co lege compared C 383 ancient Athens A 5
German s hool A 5
Gymnastics and gymnasiums P 227 228 *See also n Index* Athletics ac ident prevention S 8
Gymnosperms (*g m no spĕrmz*) d vision of flowering plants whose seeds are not protected by a seed coat F 289 295–8 T 185 *pi ture S 97 Reference Guthie* B 265
Gynecology (*gin e kŏl ō gi* or *gī nē kŏl ō gi*) in medicine M 184*a*
Győr (*gyŭr*) formerly **Raab** Hun gary town at confluence of Raab and Little Danube rivers 65 mi w of Budapest pop 55 200 for mer fortress machinery cutlery oil farm trade *map* E 425
Gypsophila *See i n Index* Baby s breath
Gypsum (*g p s m*) a soft m neral usually white G 236
crystal picture C 525
relative hardness M 281
uses G 236 cements C 165 166 *picture* C 164
varieties G 236 M 265
white sand of Nev Mexico S 38
Gypsum Cave near Las Vegas Nev discovered 1924
Gypsy also **gipsy** G 235–6 *picture* G 238
books about G 236
caravan *picture* G 238
Gypsy moth a moth of the silkworm fam ly B 367*c*
control by parasites I 165
e m damaged by E 335
forest nfestation F 239
Gyrfalcon or **gerfalcon** (*gŭr fôl kŏn*) H 292
Gyro directional in aviat on A 93 95
Gyro vertical in aviat on A 95
Gyrocompass (*g rō kŭm p(s)* G 238 *picture* G 238
Gyro horizon or **artificial horizon** in a iation A 92 N 77
Gyropilot *See in Index* Autopilot
Gyroscope (*gī'ro skop*) G 237 8 *pic tures* G 237 8
in aviation A 93 95
precession G 237 *d agram* A 441
stabi izers on ships and airplanes G 237–8
torpedo steered by T 156
Gyrus (*gī rŭs*) convoluted ridge be tween groo es
convolutions of bra n B 280



Our letter H probably started as an Egyptian picture which meant a hank of flax (1) Soon after 2000 B C a Semitic people called the Semites adopted it as an alphabetic sign for a peculiar throaty pronunciation of ch Probably they did this because to them the sign looked l ke bandages or a dressing and their word *chatil* for dressing' began with this sound They made the sign (2) much as the Egyptians did

Later the Canaanite Phoenician alphabet gave the sign two forms (3) In Hebrew the s gn was called *cheth* and other Semitic names were similar The Greeks learned the sign when the Phoenicians taught them writing But since they d d not use the peculiar ch sound of *cheth* in their speech d fferent groups of Greeks used the letter for various related sounds

The eastern or Ionic Greeks used it for the vowel sound in *cheth* lengthened into ay as in hay Thus they got their letter *eta* (4) Certain Western Greeks including the Chalcidians who settled in Italy preferred to u e this sign for the h sound in ha The Romans adopted the sign with this western meaning in their Latin alphabet From Latin the capital H came without change into English

Meanwhile a small handwritten Greek *eta* (5) had taken shape with curves from the Semitic *cheth* By the 9th century the corresponding Latin letter which indicated the sound of h had acquired a shape (6) much like our handwritten and printed small h

NOTE —For the story of how alphabetic writing began and developed *see* the articles Alphabet Writing

Haag den Netherlands *See in Index* Hague The
Haakon (*hô kŏn*) **IV** (1204–63) the Old k ng of Norway added Greenland and Iceland to Norwegian realm
invades Scotland T 120
Haakon VII (born 1872) king of Norway accepted Norwegian crown 1905 on separat on of Nor way from Sweden *N 504b–5*
Haarlem (*har lĕm*) Netherlands capital of North Holland pop 156 856 H 239 *maps* B 111 E 424 *pict ire* H 239
Hals s paintings H 251
siege (1572 73) H 239
Haba Alois (born 1893) Czech com poser experimented with quarter sixth and twelfth tone music in fluenced by ancient Slav and Greek music
Habakkuk (*hă bak uk* or *hăb ă kŭk*) a *Hebrew minor* prophet probably of 7th century B C Book of Habak kuk 8th of the minor prophets deals with the wickedness of the nation *the r se of the Chaldeans* and the appearance of God in judg ment
Habana Cuba *See in Index* Havana
Habeas corpus (*hā bē ăs kô'p s*) a writ requiring a person in custody to be brought before a court H 239 40
Merryman case T 10
Haber (*hä bĕr*) **Fritz** (1868 1934) German chemist professor Ber in University specialized in electro chemical investigations with Carl Bosch *invented synthetic process* of making ammonia Nobel prize in chemistry 1919 N 241
Haber Bosch process of nitrogen fixation *N 241*
Habichtsburg (*hä bĭkhts burK*) the Hawk s Castle seat of Hapsburgs H 261–2 *pict re* H 261
Habit H 240
involuntary action W 134

learning and L-143
study habits S-433–4
Habitant (*a-bē-tan'*), French-Canadian farmer C-85, D-156, Q-4. *See also in Index* French-Canadians
Habit-forming drugs N-13
Habsburg, ruling family. *See in Index* Hapsburg
Habutai, or habutaye (*hä-bū-tī'*) (Japanese for "soft as down"), a silk similar to China silk, but heavier.
Hacienda (*ha-si-en'da*), in Latin America name of huge landed estate for farming or stock raising, name also applied to mining or manufacturing plant S-264
Chile C-253
Mexico M-200
Hackamore, a bitless bridle for horses C-153
Hackberry, a tree (*Celtis occidentalis*) of the elm family, ranging over most of the U S, resembling the elm in aspect, with ovate leaves and rough bark, and bearing small, round, purple-skinned fruit with sweet yellowish flesh; also called sugarberry and nettle tree.
Hackbut, early handgun. *See in Index* Arquebus
Hack'ensack, N J, city 12 mi n of Jersey City on Hackensack River; pop. 29,219, airplane accessories, paper board, chemicals: *map, inset* N-164
Hackensack River, in s New York and n New Jersey, empties into Newark Bay; about 50 mi long; navigable for 16 mi *map* N-164
Hack'ett, Charles (1887–1942), operatic tenor born Worcester, Mass; début in 'Mignon', Genoa, Italy, 1915; later with Metropolitan (New York City) and Chicago Civic Opera companies
in 'Romeo and Juliet', *picture* O-391
Hackett, Francis (born 1883), American literary critic, biographer, and novelist, born Kilkenny, Ireland ('Henry the Eighth', biography; 'Queen Anne Boleyn', historical novel).
Hackett, James Keteltas (1869–1926), American actor and manager ('The Prisoner of Zenda'; 'The Pride of Jennico'); son of **James H. Hackett** (1800–1871), who was one of the most noted comedians of his day.
Hackmatack. *See in Index* Tamarack
Hackney, horse of English breed H-428*a*, *picture* H-428*c*, *table* H-428*e*
Hadassah (*ha-dās'a*), the Women's Zionist Organization of America; founded 1912 by Henrietta Szold (1860–1945); devoted especially to health work in Palestine (now Israel); the name is a Hebrew form of Esther.
Haddock, a codlike fish H-240, F-114
Haddonfield, N. J., borough, residential suburb, about 5 mi. s.e. of Camden; pop. 10,495: *map* N-165
Haddon Hall, famous old mansion in Derbyshire, England, 30 mi. s.e. of Manchester; associated with Dorothy Vernon: *picture* A-317
Ha'den, Sir Francis Seymour (1818–1910), English etcher and surgeon; in addition to distinguished career as surgeon, became foremost English etcher, causing revival of etching in England; brother-in-law of Whistler.
Hadendowa (*hä-dĕn'dō-wa*), Hamitic people of Nubia, Africa, S-442, *color picture* A-38
Hader, Elmer Stanley (born 1889), artist and writer, born Pajaro, Calif.; painted landscapes and portraits; collaborated with his wife, **Berta Hoerner Hader** (born San Pedro, Coahuila, Mexico), in writing and illustrating children's books ('Spunky'; 'Whiffy McMann'; 'The Big Snow', awarded Caldecott medal 1949; 'Lost in the Zoo').
Hades (*hā'dēz*), in Greek mythology, god of lower world, also name of lower world H-241, P-324, R-132, *picture* H-241
Aesculapius and H-300
Demeter and Persephone D-62–3, M-476*a–b*
Hercules visits H-342
Orpheus and Eurydice O-426
Hadfield, Sir Robert Abbott (1858–1940) English metallurgist, born Sheffield discovered manganese and silicon steel in 1883 ('Metallurgy and Its Influence on Modern Progress' 'Faraday and His Metallurgical Researches').
Hadhramaut (*hä-drä-mout'*), Arabic *hä-drä-mä-ot'*) a region of s Arabia in Aden Protectorate boundaries undefined: A-284, *maps* A-407, A-285
Hadji, Hajji, or Hodji, title gained by pilgrim to Mecca M-159
Hadley, Arthur Twining (1856–1930), educator and political economist, born New Haven, Conn; associated with Yale University throughout most of his life as student, teacher and as president 1899–1921, authority on railroad administration ('Railway Transportation Its History and Its Laws'; 'The Education of the American Citizen'; 'The Conflict between Liberty and Equality').
Hadley, Henry K. (1871–1937), composer, born Somerville, Mass., conducted orchestras of Seattle and San Francisco, also Manhattan Orchestra in New York; associate conductor New York Philharmonic Orchestra; composed operas ('Cleopatra's Night'), symphonies ('The Four Seasons'), cantatas, songs.
Hadley, John (1682–1744), English mathematician and physicist; invented sextant 1731; improved reflecting telescope: T-47
Hadrian, or Adrian, popes. *See in Index* Pope, *table*
Hadrian, Publius Aelius (76–138), Roman emperor, born in Spain R-188, L-131
builds wall in Britain E-358, R-188, S-64, *picture* S-65
bust, *picture* R-183
empire, *map* R-182
Pantheon erected by, *picture* A-306
rebuilds Jerusalem J-338
tomb, Castel Sant' Angelo, Rome R-197, *map* R-190, *picture* R-189
Hadrian's Wall, Roman fortification across n. England between the Tyne River and Solway Firth E-358, R-188, S-64, *picture* S-65
Haeckel (*hĕk'ĕl*), **Ernst Heinrich** (1834–1919), German biologist; advocated Darwinian views; aroused controversy by antitheological attitude ('Natural History of Creation'; 'The Riddle of the Universe').
Hafiz (*hä'fiz*), pen name of Shams-ed-Din Mohammed (died 1388?), Persian lyric poet and philosopher; tomb near Shiraz a place of pilgrimage.
Hafnium, chemical element, *tables* P-151, C-214
Hafun, Ras (*rās hä-fyn'*), cape ("ras") of Somaliland; easternmost point of continent of Africa; s.e. of Cape Guardafui: *map* A-46
Haganah (*hä-gä-nä'*), Jewish defense organization in Palestine (now Israel) P-47, I-256, *picture* I-257
Ha'gar, Sarah's handmaid, mother of Abraham's son Ishmael (Gen. xvi. xxi).
Hag'edorn, Hermann, (born 1882), author, born New York City; wrote poems, pageants, and plays; biographer of Theodore Roosevelt ('Boys' Life of Theodore Roosevelt'; 'Roosevelt in the Bad Lands'; 'The Rough Riders'); also biographies of Leonard Wood, Edwin Arlington Robinson, and others.
Hageman (*hä'gĕ-män*), **Richard** (born 1882), American composer and conductor, born Netherlands; a conductor of Metropolitan (New York City), Chicago, and Los Angeles opera companies; composed many songs ('Do Not Go, My Love') and opera ('Caponsacchi').
Hagen (*hä'gĕn*) **Walter** (born 1892), golfer, born Rochester, N.Y.; won U S Open 1914 and 1919, Professional Golfers Association tournament 5 times (1921, 1924–27), and British Open 4 times (1922, 1924, 1928, 1929); retired from competition 1949
Golf's Hall of Fame G-138
Hagen (*hä'gĕn*), Germany, industrial city on Volme River about 31 mi. n e of Düsseldorf pop 146,401; important iron-and-steel works; metal goods
Hagen, in 'Nibelungenlied', slayer of Siegfried S-177, N-232
Hagenbeck (*hä'gĕn-bĕk*), **Carl** (1844–1913), German animal dealer and showman E-327
Hagerstown (*hā'gĕrz-toun*), Md. city in center of rich farm section, 64 mi n w of Baltimore; pop 36,260; railroad shops aircraft, textiles, sand-blast and dust-collecting equipment, shoes, pipe organs, refrigeration equipment, furniture; Hagerstown Junior College; battlefields of Antietam and Gettysburg nearby *map* M-116
John Brown at B-331
Hagerstown Valley, or Cumberland Valley M-109
Hagfish, or borer, an eellike parasitic fish P-80
evolutionary position F-108
Haggai (*hăg'a-i*), 37th book of the Old Testament, also the name of a Hebrew prophet who flourished about 520 B.C.; Haggai appealed to his countrymen to restore the Temple.
Hag'gard, Sir Henry Rider (1856–1925), English novelist and writer on land economics; spent early life in S. Africa, scene of many of his best novels, including 'She', 'King Solomon's Mines', 'Allan Quatermain', 'Ayesha, or the Return of She' ('Days of My Life', autobiography).
Haggard hawk, or blue hawk, a falcon F-15
Hagiographa (*hăg-i-ŏg'ra-fa* or *hā-gi-ŏg'ra-fa*), or "Holy Writings," portion of the Old Testament P-419
Hague (*hāg*), **The** (Dutch, 's Gravenhage, also den Haag), governmental center of the Netherlands; pop. 532,998: H-241–2, *maps* B-111, E-416, 424, *picture* H-242
International Court of Justice U-240*a*, H-242
Royal Picture Gallery. *See in Index* Museums, *table*
World Court L-142
Hague Court. *See in Index* Permanent Court of Arbitration
Hague Peace Conferences H-242
armament limitation fails P-102
Peace Day F-56
Peace Palace, gift of Carnegie C-124, *picture* H-242
poison gas banned C-208
United States represented by Benjamin Harrison H-277
Ha-Ha, a game G-8*e*
Hahn (*hän*), **Otto** (born 1879), German physical chemist, authority on

radioactivity and atom discoverer with Lise Meitner of protoactinium (1918) with Fritz Strassmann achieved uranium fission 1939 awarded Nobel prize in chemistry 1944
atomic power project *table* A 464
Hahnemann (*hä ne man*) Samuel C F (1755–1843) German physician founder of homeopathy
Haida (*hī da*) Indian tribe that lives in British Columbia their houses and canoes were noteworthy I 106c *map* I 106*f table* I 107
Alaska A 283
Old Kasaan National Monument N 38 *map* N 18
totem pole *picture* F 18*b*
Haifa (*hī fä*) Israel seaport 70 mi n of Jerusalem at f ot of Mt Carmel railway terminus trade center the new harbor pop a out 130 000 I 44 47 *maps* A 285 I 256 P 45 *pict re* P 46
Haig (*hāg*) ***Douglas Haig*** *fi st Earl* (1861 1928) British soldier b rn Edinburgh Scotland served under Kitchener in Nile campaign 1898 in World War I w n f me s on mander British 1st Army 1914 I and commander i Fiel Forces British expeditionary forces in Fra e and Flanders 1915–19 made earl 1919
Haig Brown Roderick Langmere Haig (b rn 1908) Canadian writer naturalist and magistrate born Sussex England m ved to British Columbia 1927 books f r children Starbuck Valley Winter (Canadian Book of the Year for Children award 1946) Saltwater Summer and Mounted Police Patrol for adults The Western Angler
Haight (*hāt*) **Ca leb** (1815 1 01) Canadian author born Adolphustown Upper Canada (Country Life in Canada Here and There in the Home Land)
Hai Ho (*hī ho*) river of China formed just above Tientsin by confluence of Pei Ho and 3 other rivers
Hail (*hāl*) town in Nejd kingdom of Saudi Arabia 230 mi ne of Medina pop 15 000 *maps* A 285 A 406
Hail (*hāl*) in meteorology H 242
Hail Columbia patriotic song of U S N 40
Haile Selassie I (*hī le sĕ las s*) (Ras *Tafari Makonnen*) (*born*) 1892) emperor of Ethiopia educated at a French mission he became widely read and familiar with European politics and history made regent October 1928 sharing throne with his aunt Empress Zaudi tu until her death (1930) when he became sole ruler made official visit to U S in 1954 *picture* E 403
Hainan (*hī nan*) island 15 mi from coast of China in South China Sea 13 500 sq mi pop 2 500 000 jungle covered mountains rich valleys sugar cane cotton *maps* C 259 A 407
Hainaut (*ē nō*) Belgian province scene of many battles during World War I important in coal and iron mining and iron and steel works cap Mons 1437 sq mi pop 1 247 299
Hainisch (*hī nish*) **Michael** (1858–1940) president of Austrian Republic 1920 28 noted Socialist writer previously (1909) member of Austrian parliament favored Germany's annexation of Austria
Haiphong (*hī fŏng*) commercial center and port of Tonkin Viet Nam Indo China in Songkoi (Red) River delta about 80 mi e of Hanoi pop 143 000 one of chief shipping points for coffee tea silk
in that portion of Viet Nam awarded to Vietminh forces in 1954 I 124 *maps* I 123 A 407
Hair animal H 242–3 *picture* H 243 characteristic of mammals M 62 economic uses H 243 felt F 50 horn related to H 426
removed by barium hydroxide A 168
Hair human H 243 *picture* H 243
care of H 306
classification of man by R 21 H 243
color H 243
fashions in arrangement D 145 7 Japan *color picture* J 316 Masai *picture* A 40 Watusi *picture* A 39
growth and length H 243
removed by barium sulfide as depilatory A 168
root, microscopic study *color picture* M 2*b*
Hair lines B 330
Haircap moss or **pigeon wheat** M 406
Hair cloth a stiff wiry fabric made with cotton linen or worsted warp and filling of horsehair formerly used in upholstery
Hair frog in fishing *list* F 118*h*
Hairline micrometer in telescopes and microscopes M 231
Hair seal S 90
Hairsprings of timepieces W 57 58
Hairstreak butterfly
caterpillar and pupa *color picture* I 366
Hairy rhinoceros or **woolly rhinoceros** extinct species common in Europe in Ice Age R 135 *picture* M 65
Hairy woodpecker W 188
scientific name W 189
Haiti (*hā tī*) Negro republic in West Indies 10 200 sq mi pop 3 111 973 cap *Port au Prince H 244–6 maps* W 96 N 251 *pictures* H 244–6
Columbus H 245 C 418*b* 419 introduces European cattle C 141*a*
flag F 138 *color picture* F 136
Las Casas work for Indians L 105
literature L 127
products H 244–5 *map* N 257
sponges S 354
relationships to continent *maps* N 248–8 248 250–1 257–8
Santo Domingo and D 124
slavery introduced S 197 H 245
Hajji (*haj ē*) or **Hadji** title gained by pilgrim to Mecca M 157
Hake (*hāk*) fish of the hake family H 246
Hakluyt (*hāk lot*) **Richard** (1552?–1616) English geographer H 246 *map* (*map*) M 90
Hakodate (*hä kō da te*) Japan seaport on a rocky promontory in s Hokkaido pop 228 994 *maps* J 297 A 406
Halcyon (*hal sī on*) or **Alcyone** in Greek mythology K 45
Halcyon *ancient name* for kingfisher a fish eating bird K 45 B 177 *color picture* B 183
Halcyon days K 45
Haldane John Scott (1860–1936) British scientist born Edinburgh director Mining Research Laboratory Birmingham University Gifford lecturer Glasgow University in charge of government *inquiries* on ventilation respiration and cause of mine explosions (The New Physiology The Sciences and Philosophy) father of **J B S Haldane** (born 1892) professor of genetics at London University (Possible Worlds) and of **Naomi Mitchison** (born 1897) novelist (Anna Cornena)
Haldane of Cloan Richard Burdon Haldane first Viscount (1856–1928) British statesman and philosopher born in Scotland wrote Life of Adam Smith The Pathway to Reality The Reign of Relativity and The Philosophy of Humanism profound student of German philosophy tried to avert World War I sat in House of Commons 1885–1911 as secretary for war *1905 12 reorganized British army* Lord chancellor 1912–15 and 1924
Halden Norway formerly **Fredrikshald** fortified seaport on Idde Fjord pop 9419 timber trade Charles XII of Sweden was killed here during siege in 1718
Haldimand Sir Frederick (1718–91) British general and administrator *born Switzerland* fought during French and Indian wars governor of Canada 1778 84 sternly held down French sympathizers with American Revolution
Hale Adam de la *See in Index* Adam de la Halle
Hale Edward Everett (1822–1909) Unitarian minister born Boston author of The Man Without a Country H 247
Hale George Ellery (1868–1938) astronomer born Chicago special research in solar and stellar spectroscopy invented spectrohelograph organizer of Yerkes Observatory (director 1895 1905) and of Mount Wilson Observatory (director 1904–23)
sunspot theory S 453
Hale John Parker (1806–73) orator and statesman born Dochester N H long member of House of Representatives and for 18 years of Senate anti slavery advocate nominated for president by Free Soil Democrats in 185 consistently supported Lincoln throughout Civil War
Hale Lucretia Peabody (1820–1900) author and educator born Boston sister of Edward Everett Hale children's books The Peterkin Papers and The Last of the Peterkins
Hale Nathan (1755–76) American Revolutionary War soldier and patriot H 247–8 *picture* H 247
school where he taught *picture* C 448
Hale Sarah Josepha (1788 1879) editor and author born Newport N H editor Boston *Ladies Magazine* and *Godey's Lady's Book* said to have suggested Thanksgiving Day as national holiday and to have worked *for it* from 1846 onward Mary Had a Little Lamb credited to her (Northwood Sketches of American Character)
Haleakala (*hä lā ä kä lä*) volcano on Hawaiian island of Maui 10 025 ft N 36 H 288 *map* H 286 *picture* H 287
silversword plant *picture* H 288*a*
Haleb Syria *See in Index* Aleppo
Hales Stephen (1677–1761) English physiologist and inventor born Beresbourne known for his Statical Essays which describes experiments in plant physiology and in blood pressure and circulation
Halévy (*ä lā vē*) **Jacques François Fromental Elie** (1799–1862) *French* composer born Paris France won Prix de Rome 1819 professor Paris conservatory after 1827 taught his future son in law Georges Bizet also Charles F Gounod known for La Juive opera member Legion of Honor
La Juive story O 380
Halévy Ludovic (*1834–1908*) *French* dramatist and novelist for over 20 years collaborated with H Meilhac on operettas farces and comedies chiefly about Parisian life (La Belle Helène La Grande Duchesse

'Barbe Bleu'); also wrote 'L'Abbé Constantin', sentimental, popular tale, classic for French instruction.

"Half-breeds," Republicans who opposed nomination of Grant for 3d term (1880) G-21

Half life (of element) R-54*c–d*, *chart* R-54*b*

Half-moon, a lunar phase M-384, 386, *diagram* M-385

'Half Moon', Hudson's ship H-437

Half nelson, in wrestling, *pictures* W-305–6

Half-timbered. *See in Index* Architecture, *table* of terms

Half title, of a book B-239

Halftone engraving P-210*b–c*

Half-uncial writing B-235

Hal'iburton, Thomas Chandler (1796–1865), Canadian humorist; pen name "Sam Slick"; lawyer and judge in Nova Scotia; retired to England (1856) C-105

Sam Slick, *picture* C-106*a*

Halibut, a fish H-248, F-140, F-114, *picture* H-248

Halicarnassus (*hăl-i-kär-năs'ŭs*), ancient Greek city in Caria, Asia Minor, *map* G-197

birthplace of Herodotus H-349

Mausoleum S-105, *picture* S-106

Halidah Adib, or Halidé Edib. *See in Index* Edib, Halidé

Hal'idon Hill, height n.w. of Berwick-upon-Tweed, England, where English under Edward III defeated the Scots (1333).

Hal'ifax, Charles Montague, earl of (1661–1715), English statesman; introduced into Great Britain national debt instead of annual taxation to meet expenses of war; carried out recoinage (1695); patron of Newton.

Halifax, Edward Frederick Lindley Wood, earl of (born 1881), British statesman, born Yorkshire; entered Parliament 1910 as Conservative, 1924–25 minister of agriculture; 1926–32 viceroy of India; 1935 secretary of war; 1935–38 leader of House of Lords; 1938–40 foreign secretary; 1940–46 ambassador to United States.

Halifax, England, manufacturing city in n., 12 mi. s.w. of Leeds; pop. 98,376; textiles, iron products, chemicals, coal mining; *map* B-325

Halifax, important port and capital of Nova Scotia, Canada; pop. 85,589; H-248–9, *maps* C-69, 73, *picture* N-309

Hal'ite, sodium chloride in mineral form M-265

Hall, Asaph (1829–1907), astronomer, born Goshen, Conn.; professor at Harvard University; discovered two moons of planet Mars.

Hall, Charles Francis (1821–71), explorer, born Rochester, N. H.; searched for Franklin party from 1860 to 1869; died on expedition to North Pole in 1871.

Hall, Charles Martin (1863–1914), American inventor H-249, A-183–4, *picture* H-249

aluminum production patented, *table* I-199

Hall, Chester Moor (1703–71), English lawyer, mathematician, and inventor, born Leigh, Essex L-169

achromatic telescope T-47

Hall, Esther Greenacre (born 1904), author of books for girls, born Greeley, Colo.; journalist and teacher; her experiences are background for her books ('Up Creek and Down Creek'; 'College on Horseback'; 'Haverhill Herald').

Hall, G(ranville) Stanley (1844–1924), psychologist, educator, and editor, born near Ashfield, Mass.; president and professor of psychology Clark University, Worcester, Mass., 1888–1920 ('Adolescence').

Hall, James Norman (1887–1951), writer, born Colfax, Iowa; lived many years in Tahiti; author of 'Doctor Dogbody's Leg', tales, and 'My Island Home', autobiography; with C. B. Nordhoff wrote 'Mutiny on the Bounty', 'Men Against the Sea', 'Pitcairn's Island', 'The Hurricane', and 'The Dark River'.

Hall, John Harris, inventor of breech-loading rifle F-79

Hall, Lyman (1724–90), signer of Declaration of Independence; governor of Georgia (1783–85)

signature reproduced D-37

Hal'lam, Henry (1777–1859), English historian ('Europe During the Middle Ages'; 'Constitutional History of England'); father of Arthur Henry Hallam (1811–33), subject of Tennyson's 'In Memoriam'.

Halle, Adam de la. *See in Index* Adam de la Halle

Hallé (*hăl'ē*), Sir Charles (1819–95), German-English pianist and conductor, born Hagen, Westphalia; exerted important influence on musical education in England; married Mme. Norman Néruda, noted violinist

Halle (*hăl'ŭ*), Germany, city on the Saale River 20 mi. n.w. of Leipzig; pop. 222,505; large saltworks; machinery, chemicals; noted for university founded in 1694 by Frederick III, elector of Brandenburg; *maps* G-88, E-416, 424

Hal'leck, Fitz-Greene (1790–1867), poet, born Guilford, Conn.; remembered for 'Marco Bozzaris', and 'On the Death of Joseph Rodman Drake'.

Halleck, Henry Wager (1815–72), Civil War general, born Westernville, N. Y.; succeeded McClellan in July 1862 as general in chief of all Union armies; superseded March 1864 by Grant; *C-334*

Hallelujah (*hăl-ē-lĭ'yą*), a Hebrew word meaning "praise ye the Lord."

Haller (*hăl'ĕr*), Albrecht von (1708–77), Swiss anatomist, physician, physiologist, botanist, and poet, born Bern; particularly noted for doctrine of irritability of muscles ('Elementa Physiologiae Corporis Humani').

Hal'ley, Edmund (1656–1742), English astronomer; predicted return of "Halley's comet"; C-420

Newton and N-194

Halley's comet C-420, *picture* C-420

Halliburton, Richard (1900–1939), writer, lecturer, and traveler, born Brownsville, Tenn.; wrote in youthful, vigorous style; lost in attempt to sail a Chinese junk across Pacific Ocean ('Royal Road to Romance'; 'Glorious Adventure').

Hallidie (*hăl'i-dī*), Andrew Smith (1836–1900), Scottish-American civil engineer and inventor, born London, England; S-430

Hallmark, official stamp used by goldsmiths and silversmiths to indicate purity; originally used on gold and silver articles in Goldsmiths' Hall in London; used figuratively of persons or things showing signs of genuineness.

Hall of Columns, at Karnak, *color picture* A-307

Hall of Fame, for baseball men B-70. *See also in Index* Baseball Hall of Fame and Museum, National

Hall of Fame, for football coaches and players F-232

Hall of Fame for Great Americans H-249–50, *picture* N-224

Hall of the Abencerrages (*ä-bän-thä-rä'häs*), Alhambra A-167

Hall of the Ambassadors, Alhambra A-167

Halloween (*hăl-ō-ēn'*), the evening of October 31 H-250, *pictures* H-250

Hallstatt (*häl'shtät*), Austria, village on Lake Hallstatt; old and famous salt mines; ancient Celtic remains of Iron and Bronze Ages, dating back 3000 years or more.

Hallström (*häl'strŭm*), Per August Leonard (born 1866), Swedish novelist, born Stockholm, Sweden; chairman of committee of Swedish Academy for Nobel awards ('Stray Birds'; 'An Old Tale').

Hallucina'tion, imaginary perception where no actual object exists, as in delirium.

Hallwachs (*häl'väks*), Wilhelm (1859–1922), German physicist, lecturer at Leipzig and Strassburg, professor of physics at Dresden technical institute and at Giessen; in 1888 discovered underlying principle, known as the Hallwachs effect, of the photoelectric cell.

Halmahera (*häl-mä-hä'rä*), island in Moluccas, Indonesia, w. of New Guinea; over 6,500 sq. mi.; pop. 83,882; mountainous, thick forests; sago palm, rice; bombed by Americans Sept. 1944 during assault on Morotai nearby; *maps* E-203, P-16

Halo (*hā'lō*), in astronomy, luminous bands around the sun or moon caused by refraction and reflection of rays of light by the ice crystals in the atmosphere; in art, circle of light surrounding a head to denote divinity or saintliness.

Halogens (*hăl'ō-jĕnz*), the four related chemical elements fluorine, chlorine, bromine, and iodine C-288

derivation of word C-213

Halogeton, a poisonous weed of the *Chenopodiaceae* family; several species in Mediterranean and central Asia regions; first found in U.S. in n.e. Nevada 1935; now in parts of Idaho, Utah, Oregon, Nevada; poisons sheep and other animals, causing death; W-84, P-339

Hal'ophytes, plants which live in salt-water environment.

Halper, Albert (born 1904), writer, born Chicago; began writing in 1928; wrote his first novel 'Union Square' (1933) while living in poverty ('The Foundry'; 'The Chute').

Hals (*häls*), Frans (1580?–1666), Dutch painter H-250–1, P-29

'The Gypsy Girl' P-29, *color picture* P-29

Halsey, William Frederick, Jr. (born 1882), U. S. Navy officer, born Elizabeth, N.J.; led successful attacks on Gilbert, Marshall, Wake, and Marcus islands Feb. 1942; made head of naval forces in s. Pacific Oct. 1942, in command of Solomons campaign; commander of 3d Pacific fleet 1944–45; appointed fleet admiral (5-star) 1945; retired 1947.

Hälsingborg, also Helsingborg (*hĕl'sing-bôr*), seaport of Sweden; pop. 71,718; in s. opposite Helsingör, Denmark; had important part in Scandinavian wars; *maps* N-301, E-424

Halter hitch, or halter tie K-61, *pictures* K-61–2

Halutzim, Jewish pioneers in Palestine P-46

Halyard. *See in Index* Nautical terms, *table*

Halys River, in Asia Minor. *See in Index* Kizilirmak

Ham, son of Noah; traditional ancestor of Hamites (Gen. vi, ix).

Ham, East and West. *See in Index* East Ham; West Ham

Ham pork product
smoking and curing H 404 M 154
picture F 223

Hama (*hä mä*) Biblical Hamath Syria city on Orontes River 115 mi n e of Damascus remains of *ancient Hittites* now *important* trading center pop about 70 000 *maps* A 285 P 158

Hamadan (*hä mä dän'*) ancient Ecbatana manufacturing city capital of Hamadan province in w Iran pop 104 000 felt and leather *maps* A 406 I 224

Hamadryad (*hăm ə drī'ăd*) or dryad wood nymph in Greek mythology N 318

Hamadryad or **king cobra** C 373

Hamadryad baboon B 2

Hamaguchi (*hä mä' gōō chē'*) **Yuko** (1870 1931) Japanese statesman became premier 1929 called *War rior for Peace f r support of Lon* don Naval Treaty 1930 assassinated

Hamamelidaceae *See in Index* Witch hazel family

Haman (*hā' măn*) chief minister of Persian king Ahasuerus
outwitted by Esther E 399

Hamath Syria *See in Index* Hama

Hambletonian stake race for harness horses at Goshen N Y Originated *1926 for 3 year old trotters* Named for Hambletonian Thoroughbred stallion (1849 76)

Hamblin Jacob (1819 86) Mormon missionary to Indians born Salem Ohio converted to Mormonism 1842 and made elder to Utah 1850 sent as missionary to southern Utah 1854 promoted peace between whites and Indians

Hamburg a state and a city of Germany on Elbe R ver pop of city 1 605 606 H 251 2 *maps* C 88 D 416 424 *picture* H 251
harbor improvements H 251 H 264
member of Hanseatic League H 261
Tiergarten (zoo) Z-359
water front *pict re* H 251

Hameln (*hä' mĕln*) also **Hamelin** town in n w Germany 25 mi s w of Hanover pop 48 086 famed as scene of legend of the Pied Piper

Hamerton Philip Gilbert (1834–94) English writer painter and art critic (The Intellectual Life)

Hamilcar (*hă mĭl' kär*) **Barca** (270?–228 B C) Carthaginian general father of Hannibal and Hasdrubal H 259
Barcelona founded by B 54

Hamilton Alexander (1712–56) Scottish physician and diarist born *Edinburgh Scotland practiced* medicine Annapolis Md after 1739 known for Hamilton's Itinerarium journal of his trip to Maine 1744 valuable as authoritative account of social life of period quoted A 217

Hamilton Alexander (*1757–1804*) American statesman H 252–3 *pictures* H 253 C 3
John Adams and A 13 14
Bank of the United States B-52
birthday celebrated F 56
duel with Burr H 253 B 363
Hall of Fame *table* H 249
Jefferson opposes J 332*b* H 253
Marshall supports M 103
Paterson N J founded by P 97
plan of new Constitution U 342 343
portrait on $10 bill *table* M 339
quoted C 319 *l*
secretary of treasury W 22 H 253
tariff T 18

Hamilton Cosmo surname originally Gibbs (1872 1942) English novelist and dramatist brother of Arthur Hamilton Gibbs and Sir Philip Gibbs (*The Blindness of Virtue* A Sense of Humour)

Hamilton Emma Lady (1765?–1815) wife of Sir William Hamilton (1730 1803) British envoy at Naples active in social and political life of Naples an intimate of Queen Maria Carolina friend of Admiral Horatio Nelson model for many famous paintings by Romney

Hamilton Henry (died 1796) British *soldier governor of Detroit during* Revolutionary War incited Indian raids along frontier later governor of Canada and of Bermuda surrender at Vincennes C 339

Hamilton Sir Ian (1853 1947) British general joined the army in 1873 and served until 1919 distinguished himself in South Africa and India commanded Dardanelles expedition in World War I (Gallipoli Diary *Friends of England Soul and* Body of an Army Jean a biography of his wife)

Hamilton Sir William (1788 1856) Scottish philosopher as professor of logic and metaphysics at Edinburgh stimulated his students to belief in importance of psychology

Hamilton Sir William Rowan (1805–65) British mathematician born Ireland developed quaternions *a form of* calculus

Hamilton Bermuda capital and chief port of Bermuda Islands pop 2815 *map (inset* U 96*a*

Hamilton Ohio city on Great Miami River 20 mi n of Cincinnati pop 57 951 automobile bodies machinery paper safes named for Alexander Hamilton *maps* O 357 U 253

Hamilton Ontario Canada manufacturing center and port pop 208 321 *H 253 maps C 72, inset C 68*

Hamilton Mount Calif peak of the Coast Range 25 mi e of San Jose Lick Observatory O 324

Hamilton College at Clinton N Y for men founded 1793 as academy chartered as college 1812 arts and sciences

Hamilton River or **Grand River** chief river of Labrador flows e 600 mi into Melville Lake extension of *Hamilton* Inlet on Atlantic coast *maps* C 69 73 L 76

Hamites (*hăm' īts*) a native people of North Africa A 38 *map* A 39
Ethiopia E 402
Gold Coast G 134*a*
Kenya K 54*b*
Nigeria N 238
Sudan S 441

Hamlet Shakespeare's greatest tragedy based on story first told by Danish chronicler Saxo Grammaticus H 253–4 S 130
chronology and rank S 129
Kronborg Castle *picture* D 68
Leslie Howard as *picture* T 113

Hamlin Hannibal (1809 91) anti slavery statesman *born Paris Hill Me* vice president 1861 65 intimate friend and adviser of Lincoln *See also in Index* Statuary Hall (Maine) *table*

Hamline University at St Paul Minn Methodist founded 1854 at Red Wing Minn transferred 1880 to Hamline (now Midway District of Minneapolis and St Paul) arts and sciences nursing

Hamm (*hăm*) *Germany city in* n w at junction of Ahse and Lippe rivers in Ruhr Valley pop 59 866 railroad and trucking center coal steel machinery thermal baths town founded 1 226 joined Hanseatic League 1417 *map* E 424

Hammada (*hăm ä dä'*) in desert D 73*a*
Sahara S 15

Hammarskjöld (*hăm' ər shēld*) **Dag (Hjalmar Agne Carl)** (born 1905) Swedish diplomat and financial expert born Jönköping Sweden son of Hjalmar Hammarskjöld under secretary Sweden's department of finance 1936–45 chairman of board Bank of Sweden 1941–48 deputy foreign minister 1951 53 elected secretary general of the United Nations 1953 for five year term

Hammarskjold Hjalmar (1862–1953) Swedish statesman father of Dag Hammarskjöld prime minister 1914 17 member various international arbitration courts

Hammer or malleus bone of ear E 170 S 192 *pictures* E 170 1

Hammer a tool T 148 150 *pictograph* T 151
ball peen B 204*a*
claw *picture* M 160*a*
pneumatic P 328–9 T 150 *diagrams* P 329

Hammer and sickle emblems in Russian flag F 136*c*, *color picture* F 133

Hammerfest (*hăm' ər-fĕst*) Norway port on Kvalö Island on Arctic Ocean pop 3539 northernmost town in Europe ice free harbor N 304*b* *map* E 417

Hammerhead shark S 135

Hammerlock wrestling hold *picture* W 306

Hammersmith England western borough of London pop 119 317 boat building and other manufactures home of William Morris

Hammerstein (*hăm' ər stīn*) **Oscar** (1847 1919) American opera and theater director born Germany manager Manhattan Opera House N Y *foremost in establishing* French opera in America

Hammerstein Oscar II (born 1895) lyric writer and librettist born New York City adapted Show Boat wrote book and lyrics for *Rose Marie Desert Song* Oklahoma Carmen Jones Carousel Allegro South Pacific (for these last five Richard Rodgers wrote the music) was coproducer with Rodgers of I Remember Mama and Annie Get Your Gun
The King and I *picture* A 400*l*

Hammer throwing a sport T 163 *picture* T 162
world record *table* T 161

Hammett (Samuel) Dashiell (born 1894) author born St Marys County Md founder of hard boiled school of detective fiction (The Maltese Falcon The Glass Key The Thin Man The Adventures of Sam Spade) some stories dramatized in motion pictures and on radio

Hammond John Hays (1855–1936) mining engineer born San Francisco associated with Cecil Rhodes in South Africa sentenced to death after Jameson raid but was released by Boers upon payment of a $125 000 fine after 1900 active in U S and Mexican mining development and in hydroelectric and *irrigation projects*

Hammond John Hays Jr (born 1888) inventor son of the above born San Francisco inventor of radio controlled torpedoes radio system for controlling ships a system of selective radio telegraphy

Hammond Laurens (born 1895) inventor of Hammond electric organ born Evanston Ill also invented novachord and electric card *shuffling bridge table president of* Hammond Instrument Co O 424

Hammond Ind manufacturing and railroad city on Lake Michigan ad-

joining Chicago; pop. 87,594; steel products, railroad cars and supplies, corn products, chemicals soap, petroleum products: I-84, *map* I-78
Hammurabi (*ha-mu-rä'bē*) (about 1800 B.C.), king of Babylonia organizer of empire and codifier of laws: B-7–8
prohibition laws P-416
Hamp'den, John (1594–1643), English Puritan, patriot, and statesman H-254
Hampden, Walter (Walter Hampden Dougherty) (1879–1955), actor, born Brooklyn N. Y.; debut in England 1901 with classical repertoire company; notable in 'Hamlet', and other Shakespearean plays, 'The Servant in the House', 'Cyrano de Bergerac', and 'The Patriots'
Hampden-Sydney College, at Hampden-Sydney, Va.; Presbyterian for men; founded as Prince Edward Academy in 1776; arts and sciences
Hampshire, county of s England, area 1650 sq. mi., pop 1,292,211 includes administrative counties of Southampton (area 1503 sq. mi.; pop. 1,196,617) and Isle of Wight county of Southampton popularly called Hampshire includes ports Southampton and Portsmouth *map* E-347
chalk deposits, *picture* M-265
Hampshire, breed of hog H-404
Hampshire, breed of sheep S-138
Hampstead, England metropolitan borough in n.w. of London pop 95,073; formerly noted for mineral springs; residence of first Earl of Chatham, John Constable George Romney, Sir Richard Steele, John Keats, Leigh Hunt
Hampstead Heath, open space of 240 acres in north of London preserved to great extent in natural state
Hampton, Wade (1818–1902), statesman and Confederate general born Charleston S.C.; raised and equipped "Hampton's legion"; U.S. *senator 1878–91*; U.S. commissioner of Pacific railroads 1897–97 *See also in Index* Statuary Hall (South Carolina), *table*
elected governor of South Carolina R-86, *picture* R-85*b*
Hampton, Va., port city in s.e. situated on Hampton Roads and bordered by cities of Warwick and Newport News, pop 60,994; fisheries and sea-food processing; *metal* products, building materials; Hampton Institute; Langley Air Force Base and U.S. Fort Monroe. Settled 1610, it is oldest continuous English community in America Site of first free school in American Colonies. Provided haven for exiled Acadians 1755. Town attacked by British in War of 1812; burned by Confederates in Civil War to prevent occupation by Federals. Chartered as city 1908 Enlarged in 1952 by consolidation with county of Elizabeth City and town of Phoebus: N-242*b*, *map* V-487
Hampton Court, England, palace on Thames River 10 mi. s.w. of London, *pictures* E-366, W-304
Hampton Institute, at Hampton, Va.; founded 1868; for Negroes; agriculture, business, education, home economics, nursing: N-108
Booker T. Washington at W-15
Hampton Roads, channel in which James, Nansemond, and Elizabeth rivers converge and flow into Chesapeake Bay, Va. C-224
Civil War, *map* C-335: battle of *Monitor* and *Merrimac* M-346–7, *picture* C-337; peace conference S-391
naval operating base N-242*b*
Hampton Roads, Port of N-242*b*
Hamster, small rodent H-251, *picture* H-254
altitude range, *picture* Z-362
origin of name P-182*b*
pets care of P-182*b*
Ham'sun, Knut (1859–1952) Norwegian novelist as young man worked at odd jobs was streetcar conductor in U.S. later settled at Grimstad Norway famous after 1888 when novel 'Hunger' appeared also wrote Growth of the Soil' (Nobel prize 1920) 'Women at the Pump' 'Pan' 'Vagabonds', and 'Look Back on Happiness'
Hamtramck (*hăm-tram'ĭk*), Mich manufacturing city surrounded by Detroit pop 43,355 (3,550 in 1910) wheels iron and aluminum castings automobile accessories *map inset* M-227
Han, 'the river" in Korea rises 30 mi from e coast cuts Korea nearly in half, and flows through Seoul and thence into Yellow Sea 292 mi long, navigable for about 75 mi for motor and sailing boats *map* K-65
Hanau (*hä'nou*) Germany city on Main River 10 mi E of Frankfurt, pop 30,625, machinery, Napoleon defeated Bavarians in 1813 *map* E-425
Hanby, Benjamin Russel (1833–67), song writer born Rushville Ohio, pastor United Brethren Church 1861–63 ('Darling Nelly Gray' 'Little Tillie's Grave' 'Ole Shady' 'Up on the House-top' 'Who Is He in Yonder Stall?')
Han'cock, John (1737–93), American patriot, first governor of Massachusetts H-254–5
burial place B-258
Gage attempts to arrest L-178
president of Continental Congress, *picture* R-120
signature reproduced D-37
Hancock, Walker (**Kirtland**) (born 1901), sculptor, born St. Louis, Mo., won Prix de Rome 1925; instructor in sculpture Pennsylvania Academy of Fine Arts, Philadelphia, Pa., after 1929
bust of Robert Frost, *pictures* S-74
Hancock, Winfield Scott (1824–86), Union general in Civil War H-255
Hancock, Mich., copper-shipping port opposite Houghton on Lake Portage, connected with Lake Superior by canal; pop. 5223; foundries, woodworking plants, creameries, smelters; Suomi College and Theological Seminary: *map, inset* M-226
Hand, (Billings) Learned (born 1872), jurist, born Albany, N.Y.; admitted to bar 1897; judge U.S. district court for s. N.Y. 1909–24; judge U.S. 2d circuit court of appeals 1924–51; made recording for Library of Congress collection of American folk songs; author of 'Spirit of Liberty'; Papers and Addresses'.
Hand, in anatomy H-255–6, *picture* H-256
bones of S-192
man's and ape's, *picture* A-270
monkey M-348–9
palmar surface F-69, H-255, *picture* F-69
right- and left-handedness C-240*b*
whale flippers W-111–12 *picture* H-256
Hand, unit of measurement equal to 4 in. (supposed width of palm), used to measure height of horses.
Handball, a fast game of ancient Irish origin H-256–7, *diagram* H-257
Handbooks and manuals R-88*i–j*
selected list R-88*j*
Hand cannon F-76, *picture* F-77
Han'del, George Frederick (1685–1759), German-English composer, master of the oratorio H-257–8, *picture* H-257
music analyzed M-462
'The Child Handel', *picture* P-249
Handel and Haydn Society M-466
Handforth, Thomas (1897–1948), etcher, lithographer, and portrait painter, born Tacoma, Wash.; studied art in Paris and the Far East; prepared children's picture books: 'Mei Li' (Caldecott medal 1939); 'Faraway Meadow'.
Handicraft, craft requiring skilled use of hand tools *Reference-Outline* I-147–8
bibliography H-397–8, I-148
Hand organ, or **barrel organ**, musical instrument with revolving barrel or cylinder; used by itinerant musicians, celebrated in poem, 'The Barrel-Organ', by Alfred Noyes.
Handshake, origin E-404
Handwriting H-258. *See also in Index* Writing
Handy, William Christopher (born 1873), Negro composer, born Florence, Ala.; wrote some of the first "blues" music which influenced the later "jazz" and "swing" ('Memphis Blues'; 'St. Louis Blues'; 'Beale Street Blues').
Han (*hän*) **Dynasty** (206 B.C.–A.D. 220), China C-278–9
arts S-84; pottery C-277, P-394, S-84, *color picture* P-395
Hanford Operations Office, Atomic Energy Commission W-38
Hangar (*hăng'ẽr*), a structure that houses aircraft
polar regions, *picture* P-350*b*
Hang'chow, China, 100 mi. s.w. of Shanghai; capital of Chekiang province; pop. 437,522; H-258, *maps* C-259, A-406
Hanging Gardens of Babylon, one of the Seven Wonders of the World S-104, B-5, *pictures* B-9, S-106
Hangö (*häng'ö*), Finnish **Hanko** (*häng'kō*), Finland, seaport on Gulf of Finland at entrance to Gulf of Bothnia; pop. 6791; called "Gibraltar of Finland" because of strategic position: *maps* E-417, R-266
Hankow, China, city 600 mi. up the Yangtze River from Shanghai; pop 749,952: H-258–9, *maps* C-259, A-406
Hanks, Nancy (1784?–1818), mother of Abraham Lincoln L-246
Han'na, Marcus Alonzo, known as **Mark** (1837–1904), merchant and political leader, born New Lisbon, Ohio; lived in Cleveland; friend adviser, and political backer of President McKinley; U.S. senator 1897–1904
McKinley and M-17, 19
Hannah, a pious Hebrew woman, wife of Elkanah and mother of the prophet Samuel.
Hannay, James Owen. *See in Index* Birmingham, George A.
Hannegan, Robert E. (1903–1949), lawyer and political leader, born St Louis, Mo.; Democratic National Committee chairman 1944–47; postmaster general in President Truman's Cabinet 1945–Dec. 1947
Han'nibal (247?–183 B.C.), Carthaginian general H-259–60
bust, *picture* R-183
meaning of name B-1
Hannibal, Mo., manufacturing city and trade center on e. state border on Mississippi River; pop. 20,444; scene of Mark Twain's boyhood and setting of his 'Huckleberry Finn' and 'Tom Sawyer': *maps* M-319, U-253
Mark Twain's home, *picture* M-322

Hanno name of several Carthaginian soldiers and statesmen best known is an admiral who explored n w coast of Africa about 500 B C and **Hanno the Great** (3d century B C) statesman and general opponent of Hamilcar and Hannibal

Hannover, Germany *See in I dex* Hanover

Hano a Tewa Indian pueblo estab lished among the Hopi in Ar zona in 1700 by migrants from the R o Grande in New Mexico often but improperly called Tewa

Hanoi (*hă noi*) one of largest cities of *Indo China* in n on *Songk i* (Red) River capital of Tonkin was often regarded as cap tal of Viet Nam although Saigon was the administrative center pop 237 150 trade in silk and rice in that por tion of Viet Nam awarded Vietm nh forces in 1954 I 124 *maps* I 123 A 407
university I 125

Hanotaux (*a nŏ tō*) **Gabriel** (1853 1944) French political leader and historian History of Contemporary France standard work in its field edited 17 volume History of the French Nation was at various times minister of foreign affa rs *and ardently supported French* Russian alli nce in 1921 delegate *to League of Nations*

Hanover also **Hannover** a former Prussian prov nce in n w Germany 14 837 sq mi pop 3 540 000 in corporated into Lower Saxony (Niedersachsen) after World War II H 260

Hanover also **Hannover** Germany capital of Lower Saxony In f rmer province of Hanover pop 444 796 H 260 *m ans* G 88 E 424

Hanover N H *town on Connecticut* River 5o mi n w of Concord pop of townsh p 6259 *map* N 151
Dartmouth College *picture* N 153

Hanover Pa borough 3o mi s of Harrisburg in rich agricultural re gion pop 14 048 wire products paper shoes silk *map* P 133

Hanover House of also **House of Brunswick** line of British rulers H 260 G 66
rulers l st of *See in In lex* England *s bhead* kings and queens *table*

Hanover College *at Hanover* Ind founded b y J reshyterians in 1827 *charter* d un der *present name* 1833 arts and sciences

Hans Brinker or the Silver Skates story by Mary Mapes Do ge te l ng of journey from Amsterdam to the Hague on skates L 274

Hanseatic League medieval confed eration of n European *cities* for promotion of commerce H 260–1
Bergen N 304*b*
Bremen B 300
Danz g D 17
Hamb rg H 252
merc ant guilds and G 228
Riga R 153*b*
Swedish cities S 463

Hansel and Gretel German **Hansel und Gretel** (*han zel unt gr tl*) Ger man foll ta e two chi dren Han sel and Gretel lost in the woods outwit an ogress who turned ch l dren into g ngerbread story retold by Grimm brothers subject of opera by Humperdinck (1893) *pic ture* S 404

Hansen (*han sen*) **Gerhard Henrik Armauer** (1841–1912) Norwegian physician discoverer of leprosy bacillus

Hansen Dam in California on the Big Tujunga Creek *See also in Index* Dam *table*

Hansen's disease another name for Leprosy *See in Index* Leprosy

Hanska Countess Eve de Balzac's wife B 42

Hanson Howard (born 1896) com poser born Wahoo Neb d rector Eastman S hool of Mus c Roch ester N Y besides various choral and orchestral pieces composed opera Merry Mount and two symphon es Nordic and Romantic

Hanson John (171o 83) statesman born C harles County Md repre sented Maryland n Cont nental Congress 1781 83 *and was first* president elected (1781) under Articles of Confederation served a year P 409 *See also in I dex* S tatuary Hall (Maryland) *tat le*

Hanson Timothy New Englan l agr ulturist for wl om t mothy grass was named A 63

Hanuka or **Chanukah** (*Kun ŏ ka*) Jew sl fest val commemorating re newe l services in Temple at Jeru salem h ch had been desecrate l by Ant o hus IV but was restored nder the eadersh p of Judas Mac cabaeus begins with 25th day of K sl v (December) and asts 8 days n first n ght a candle s lighted an l on each successive n ght new one is a ded also kn wn as Feast of Lights and Feast of Dedication *See also in Index* Mac abees

Hanuman (*Hun u mat*) an E st In d an monkey M 3o1–2 *pict ure* M 350

Hanyang (*han yang*) China city ad j ining Hankow H 2o8

Haoles (*ha ō las*) in Hawaii H 288a

Hapgood Norman (1868–193) wr ter and editor born Chicago editor *Coll er's Weekly* 1903 12 *Harper's Weekly* 1913 16 *Hearst's Inter national* 1923–25 (Abraham Lin coln George Wash ngton The *Changing Years*)

Happy Hunting Ground the white man's vers on of the North Amer can Indian's idea of heaven not included in Ind an religious beliefs

Hapsburg (*H ps burg* German *haps burk*) or **Habsburg** fam o s Ger man princely fa ly which supp ed rulers for Austria Spa n and Holy Roman Emp re H 281–2 A 496–9 For l sts of important ru ers *see in Index* Holy Roman Empire *table*, Spain history of
Lohengrin acq ired B 221
Hawk's Castle *p ctur e* H 281
Hungary acq i red H 450
Italy I 27o 273
Netherlands N 120
Sch nbrunn palace *picture* A 496
Spanish branch begins A 497 last r ler A 497
Switzerland S 482 battle of Sem pa h W 156
World War I brings downfall W 231 A 499

Harpsburg Lorraine House of A 498

Hara (*H ra*) **Takashi** (1856–1921) first commoner to become prime m n ster of Japan (1918) and first prime m n ster dire tly respons ble to parliament prev ously leader of Seiyu Kai (Liberal) p rty and three t mes min ster of home af fairs assassinated

Hara kiri (*hăr'a k ri*) *su cide* by disemboweiment practiced in *Japan obligatory* hara kiri for merly common abol shed n 19th century but voluntary form is still practiced out of loyalty to a dead superior to av o i dishonor in battle or as protest against a national policy

Harald *See in Index* Harold

Haran (*ha ran*) Turkey village near Syrian border ancient city Carrhae (*kar ē*) ruins Crassus slain here by Parthians 53 B C *map* P 156

Harar (*ha rar*) city in e central Ethiopia pop 45 000 center of fertile coffee district E 403 *maps* E 402 A 48

Harbin Manchuria *See in In lex* Pinkiang

Harbor *See in Index* Harbors and ports

Harbord James Guthrie (1866 1947) Army offi er born Bloomington Ill entered Army 1889 as private notable services in World War I during which he atta ne l rank of major general chief of staff A E F 1917 18 com manded Marine br gade June July 1918 ret red from Army 1922 *president* later chairman f the board I adio Corporat on of Amer ca W 238

Harbors and ports H 262 5 *pictures* H 262–5
Amer an colon l seap rts A 196 203
Australia coast line A 478
C v l zat on affected by H 262
d ys H 264–5 *See also in In lex* D ck
Europe E 414
form ed by drum n l coasts H 263
free port T 16 H 262
Great Lakes G 181
international law I 190 191
natural harbors H 262 4
North America N 247
quarantine rules U S H 318
requirements for H 262 3
South America S 248 258
tonnage dues basis of S 161

Harbor seal or leopard seal S 88 90

Harbour Grace Newfoundland se on l seaport of the Island on Concept on Bay connected w ith St Johns 25 mi w by Newfoundland l Piver *pop 2331 bo ts and shoes cod* liver and seal oils fish starting point for early transatlantic fliers *map* C 73

Harcourt Sir William Vernon (1827–1904) English statesman and de bater loyal l eutenant of Cla l stone home secretary 1880 8 as hancellor of ex heq er 1892 95 *introduced graduated) incom e tax* after Gladst ne's retirement 1894 *he ld L berals in House of Com* mons but disagreements with Rose bery led him to retire in 1898

Hardangerfjord (*H r d ng er f rd*) inlet 7o mi long on w coast of Nor way *maps* N 301 E 424

Hard Cider Campaign H 278

Hard clam *See in Index* Hardshell clam

Hard coal *See in In lex* Anthracite

Hardee William J (181o 73) soldier born Camden County Ga grad uated from U S M l tary Academy served in Mexi an War and fought sk llfully as brigadier general in Confederate army

Harden Sir Arthur (1865 1940) Eng l sh b o l emist born Manchester shared 1929 Nobel prize in m edic n e and physiology w th Hans von Euler Chelpin for their research s into fermentation of sugars and the action of enzym es in this pro ess

Hardenberg (*har den berk*) **Karl August** prince von (1 o –1822) Prus lan statesman he enforced

and amplified Baron Heinrich Stein's reforms, including abolition of serfdom.
Hardening metals
cyaniding C-532
nitriding process I-245
Hard'hack, a species of spirea S-352
Hardhead sponge S-354
Hardicanute. *See in Index* Harthacanute
Hardie, James Keir (1856–1915), British labor leader, born in Lanarkshire, Scotland; led the Scottish Labor party (1889) and the Independent Labor party (1893); after 1906 leader of Labor party in House of Commons.
Harding, Chester (1792–1866), portrait painter, born Conway, Mass.; was first an itinerant portrait painter; later in Boston and London became successful painter of prominent Americans and Englishmen; work clear and straightforward and full of character, though lacking in technique B-252
Daniel Boone portrait, *picture* B-251
Harding, Florence Kling (1860–1924), wife of President Harding W-128*b*–9
Harding, Warren Gamaliel (1865–1923), 29th president of U.S.: H-266–8, *picture* H-266
administration (1921–23) H-266–8
Fordney-McCumber tariff H-267
Hoover as secretary of commerce H-421
immigration, first quota law I-47
oil leases H-268
Taft chief justice T-5
treaties ending World War I W-240
Washington conference and treaties H-267, P-102
character H-266, 268
election W-240, H-266
wife W-128*b*–9
Hardinge (*här'ding*) **of Penshurst, Charles Hardinge, first Baron** (1858–1944), viceroy of India 1910–16; put into effect Morley-Minto reforms; loyalty of India during World War I largely due to universal esteem for viceroy; moved capital to Delhi and held famous "durbar" 1911; his grandfather, **Henry Hardinge**, first Viscount (1785–1856), was governor general of India 1844–48.
Harding grass, a common name for the perennial grass *Phalaris stenoptera;* native home unknown but grown in California; used as forage plant, grows to one foot, with short branching rootstock, narrow leaves; lilac spikelike clusters; also called Peruvian winter grass.
Hard maple. *See in Index* Sugar maple
Hardness, in physics M-142*c*
diamond D-78
minerals, scale of M-261
substances that are hardest A-173
Hardpan, hardened bed of earth sometimes found underneath surface soil.
Hard-shell clam, hard clam, littleneck, round clam, or quahog C-339
shell used as money S-141
Hard soap S-211, 213
Hardtack, unsalted, unleavened hard bread, used by campers and soldiers B-298
Hard times. *See in Index* Panics and depressions
Hardwar (*härd'wär*), India, ancient town in Uttar Pradesh state, on right bank of Ganges River; pop. 40,823; Hindu place of pilgrimage; large annual fair; *picture* I-56
Hard water W-63, W-72, C-18
soap for S-213
Hard wheat W-115
bread B-295
Hardwood W-186, F-239*b*, *pictures* T-180–3, *table* W-186*c*
greatest center in U. S. M-171
Hardy, Arthur Sherburne (1847–1930), mathematician and novelist, born Andover, Mass.; professor of civil engineering at Dartmouth 1874–93; minister to Persia, Rumania, Switzerland, Greece, and Spain ('But Yet a Woman'; 'Passe Rose'; 'His Daughter First').
Hardy, Thomas (1840–1928), great English novelist and poet, noted for somber view of life H-268, E-381
Hare, Robert (1781–1858), chemist, born Philadelphia; invented (1801) oxyhydrogen blowpipe (this could fuse refractory metals and therefore hastened founding of platinum industry), built electric furnace 1839
Hare, William H. (1838–1909), Protestant Episcopal bishop, born Princeton, N.J., for 36 years "Apostle to the Sioux" in South Dakota; founded successful boarding schools for Indians
Hare, animal *See in Index* Rabbit and hare
Hare, or Lepus, a constellation, *chart* S-379
Harebell. *See in Index* Bluebell
Harefoot, nickname of King Harold I of England H-270
Harelip, source of name R-16
Ha'rem, in Mohammedan countries, apartment of a house reserved for female members of family; also the women themselves. Life in harem closely regulated by custom.
Hare's-tail grass, a genus, *Lagurus*, with one species (*L. ovatus*) of the grass family, native to Mediterranean; grows to one foot; used in bouquets as an everlasting.
Hare system, or single transferrable vote, a system of proportional representation, used in some American cities and in some parts of British Commonwealth, which gives minorities representation on elective bodies in proportion to votes received. Voters indicate first, second, or other choices. A quota of votes necessary for election is fixed. If all seats are not filled, surplus votes of successful candidates and those of weakest candidates are distributed. *See also in Index* Proportional representation; Preferential voting
Hare wallaby K-2
Harfleur (*är-flür'*), town in n. France 4 mi. e. of Havre; pop. 5052; formerly important seaport; twice occupied by English in 15th century; pillaged by Huguenots in 1562.
Hargreaves (*här'grēvz*), **James** (1730?–78), English inventor H-269
Arkwright and A-371, 372
place in Industrial Revolution I-131, I-202
spinning jenny H-269, I-131, *picture* H-269
Häring, Georg Wilhelm Heinrich. *See in Index* Alexis, Willibald
Harkness, Stephen V. (1818–88), American businessman, associated with John D. Rockefeller; family have been important philanthropists; his widow, **Anna M. Richardson Harkness** (1838–1926), established the Commonwealth Fund; his son, **Edward Stephen Harkness** (1874–1940), gave large sums to Harvard, Yale, Columbia, and the New York City Medical Center.
Harlan, James (1820–99), lawyer and legislator, born Clark County, Ill.; U. S. senator from Iowa, and for years a Republican leader in that body; appointed secretary of the interior in 1865 by President Lincoln, whose son Robert married Harlan's daughter. *See also in Index* Statuary Hall (Iowa), *table*
Harlan, John Marshall (1833–1911), associate justice of the U.S. Supreme Court from 1877 to his death; term of service exceeded only by Chief Justice Marshall; was a liberal constructionist of the Constitution and generally favored increase in federal power.
Harlan, John Marshall (born 1899), jurist, born Chicago, Ill.; grandson of John M. Harlan (1833–1911); chief counsel New York State Crime Commission 1951–53; judge U. S. court of appeals for second circuit 1954–55; appointed associate justice U. S. Supreme Court 1955.
Harland, Henry (1861–1905), Anglo-American novelist, born St. Petersburg (now Leningrad); educated in U.S., lived later years in London; 'The Cardinal's Snuffbox' his best and most popular novel; edited *The Yellow Book.*
Harland, Marion. *See in Index* Terhune, Mary Virginia
Harlech (*här'lĕk*), ancient seaport in w. Wales; ruins of Harlech Castle, captured by Yorkists 1468.
Harlech Castle, in Wales, *picture* B-322
Harlem River, N.Y., n. boundary of Manhattan Island, *map* N-222
Harlequin (*här'lĕ-kwin* or *här'lĕ-kin*), in pantomime, an amusing and good-natured character; wears tights and mask; lover of Columbine. *See also in Index* Pierrot
Harlequin, a coral snake S-208
Harlequin bug. *See in Index* Stinkbug
Harlequin opal J-350
Harley, Robert, earl of Oxford (1661–1724), English statesman, born London; secretary of state (1704), lord treasurer (1711). The books and manuscripts collected by Harley and son Edward are known as the Harleian Collection: L-183
Har'lingen, Tex., city in lower Rio Grande Valley 225 mi. s. of San Antonio; pop. 23,229; citrus fruits, cotton, vegetables; cotton gins and compresses; *maps* T-91, U-252–3
Harmar, Josiah (1753–1813), soldier, born Philadelphia; served under Washington and Lee in Revolutionary War; unsuccessful in quelling Indian uprisings n. of Ohio River (1785–87, 1790); adjutant general of Pennsylvania (1793–99).
Harmat'tan, a type of wind W-150, S-15
Harmodius. *See in Index* Aristogiton
Harmon, Daniel Williams (1778–1845), Canadian fur trader and author, born Vermont; joined North West Company in 1800 ('Journal of Voyages and Travels in the Interior of North America').
Harmon, Judson (1846–1927), lawyer and political leader, born Newton, Ohio; attorney general 1895–97; governor of Ohio 1909–13; Democratic nominee for U.S. president 1912.
Harmonic, in sound, an overtone S-238–9
Harmon'ica, or mouth organ H-269–70, *picture* M-471
Harmonic minor scale, in music M-469
Harmo'nium, or reed organ O-424
Harmony, in color C-394–5, 400, *color picture* C-395
dress design D-150
Harmony, in music M-468*a*, 460
Harmsworth, Alfred. *See in Index* Northcliffe, Viscount
Harnack (*här'näk*), **Adolf von** (1851–1930), German Protestant theolo-

gian an authority on early church history sought to reconcile science and Bible (History of the Christian Dogma What Is Christianity?)
Harnden William F (1812–45) pioneer expressman born Reading Mass D 458a
Harned Virginia (1868–1946) American actress created title role of Trilby 1895 wife and leading woman of E H Sothern 1896 to 1910
Harness in weaving S 351
Harnett Cornelius (1723?–81) statesman North Carolina leader N 273
Harney William S (1800 1889) American general won distinction fighting Indians in Florida Everglades and in battle of Cerro Gordo in Mexican War later fought Indians in the West recalled from command of Oregon Territory for seizing San Juan Island claimed by British Harney Peal highest point in Black Hills named for him
Harney Peak in Black Hills in s w South Dakota highest point in state (7242 ft) and in Black H lls *map* S 302
Harnoncourt René d (born 1901) illustrator of children s books born Vienna Austria now living in United States authority on folk art of the Mexican Indian picture books Mexicana Hole in the Wall also Illustrated Painted Pig by Elizabeth Morrow
Harold I (died 1040) king of England illegitimate son of Canute H 270
Harold II (1022?–66) king of England last Anglo Saxon king H 270 battle of Hastings H 280
Harold I or Harald (850–933) Fair Haired first king of united Norway succeeded 872 conquered local kings who fled to Iceland the Orkney Shetland and Hebrides islands to escape taxation N 296b
Harold III Sigurdsson or Harald (1015?–66) king of Norway succeeded 1047 with Tostig exiled brother of Harold II of England *sought to conquer England* slain at Stamford Bridge
Oslo founded by O 426b
Harold Bluetooth (died 985?) or **Harald** king of Denmark 940?–985 son of Gorm Christianized Denmark killed in war *against Sweyn* his son
Haroun al Raschid *See in Index* Harun al Raschid
Harp constellation *See in Index* Lyra
Harp stringed musical instrument H 270–1 *picture* M 471
Aeolian A 30
range M 470
South American Indian *picture* S 262
Harpagon (*ár pa gôn*) the miser in Molière s L Avare
Harpaston ancient football game F 230
Harper Theodore Acland (1871–1942) American writer born Christchurch New Zealand mining engineer in Alaska Siberia and other parts of world wrote adventure stories for boys many with wife **Winifred Mary Hunter Brown Harper** (Siberian Gold Kubick the Outlaw Mushroom Boy)
Harper William Rainey (1856 1906) Semitic scholar and educator born New Concord Ohio first president of University of Chicago 1891 to his death
Memorial Library University of Chicago *picture* I 30
Harpers Ferry W Va town at junction of Shenandoah and Potomac rivers pop 822 W 99 H 271, *map* W 107 *picture* H 271
Civil War C 335 *map* C 335
flood *picture* F 143
John Brown s raid B 331 H 271 *picture* C 331
Harpers Ferry National Monument Project in West Virginia N 35 *map* N 13
Harpoon a barbed spear
Eskimo *picture* E 394
Harpoon gun W 114 *picture* W 112
Harp seal Greenland seal or saddle back S 90
Harp shell (*Harpa ventricosa*) gastropod shell color *picture* S 139
Harpsichord forerunner of piano P 247 *pictures* P 248–9 A 193d
Harpur Charles (1813–68) Australian poet born Windsor near Sydney Australia first Australian poet of importance (poem The Creek of the Four Graves)
Harpy bird monster in Greek and Roman mythology H 271
Harraden Beatrice (1864–1936) English novelist who leaped into fame with her first novel Ships that Pass in the Night published 1893
Harrier a cross country runner T 163
Harrier a hunting dog table D 118a
Harriman Edward Henry (1848–1909) capitalist railway organizer born Hempstead N Y obtained control of and rehabilitated bankrupt Union Pacific 1898 failed in contest with J J Hill for control of Northern Pacific but finally dominated railroad world before his death
contest with Theodore Roosevelt over Northern Securities Co R 223 *fight for control of Northern Pacific* S 399
Harriman Florence J (born 1870) public official born New York City manager New York State Reformatory for Women 1906 18 only woman member Federal Industrial Relations Commission 1913–18 minister to Norway 1937–41 wrote From Pinafores to Politics
Harriman W(illiam) Averell (born 1891) financier and statesman born New York City son of Edward Henry Harriman chairman of board of Union Pacific Railroad lend lease expediter to London and Moscow 1941–43 ambassador to Russia 1943 46 to Great Britain 1946 secretary of commerce 1946–48 roving ambassador for ECA 1948–50 special assistant to President Truman for foreign affairs (appointed June 1950) and director Mutual Security Agency 1951 53 governor of New York from 1955
Harriot Thomas (1560 1621) English mathematician born Oxford introduced some of the symbols and notations used in algebra today
Harris Abram L(incoln) (born 1899) Negro educator born Richmond Va professor and head of economics department Howard University Washington D C 1936–45 faculty University of Chicago 1948 professor *after 1949 with S D Spero* wrote The Black Worker N 108
Harris Corra May (White) (1869–1935) writer born Farm Hill Ga married Rev L H Harris who *died* 1910 (A Circuit Rider s Wife My Book and Heart)
Harris Frank (1856 1931) American author and critic born in Ireland came to U S when 14 later lived chiefly in Europe edited magazines in England and U S many of his writings notorious for their frankness (The Man Shakespeare Oscar Wilde My Life and Loves)
Harris George Washington (1814–69) humorist born Allegheny City Pa jewelry craftsman and steamboat captain *in youth* wrote first sketch under pseudonym Sugar tail stories told in mountaineer dialect with fresh boisterous humor (Sut Lovingood Yarns)
Harris J(ames) Arthur (1880–1930) biologist and statistician born Plantsville Ohio head of department of botany University of Minnesota after 1924 author of many technical papers A 229
Harris Joel Chandler (1848 1908) American author H 271 3 *picture* H 272
memorial in Atlanta A 451
Uncle Remus stories F 3 I 199–200 *pictures* L 214 African source S 419
Harris Robert (1849–1919) Canadian painter born Wales noted for portraits and genre president Royal Canadian Academy 1893 1906
Harris Roy (born 1898) composer born Lincoln County Okla Third Symphony (1939) recognized as distinctively American works include symphonic vocal and chamber music (Song for Occupations Folk song Symphony)
Harris Townsend (1804–78) merchant political leader diplomat born Sandy Hill N Y first U S consul general and first U S minister to Japan negotiated commercial treaty (1858)
Harris William Torrey (1835–1909) educator and philosopher born North Killingly Conn U S commissioner of education 1889–1906 leading American expounder of Hegelian idealism
Harrisburg Ill city in s 62 mi ne of Cairo pop 10 999 coal mining agriculture flour packing house products *map* I 37
Harrisburg Pa state capital and manufacturing city pop 89 544 H 273 *maps* P 193 U 253
Capitol State H 273 *picture* P 137
Harrison Anna Symmes (1775 1864) wife of President William Henry Harrison W 127
Harrison Benjamin (1726? 91) patriot born Charles City Co Va father of William Henry Harrison delegate to Congress 1774–78 governor of Virginia 178– 84
signs Declaration of Independence H 277 signature reproduced D 37
Harrison Benjamin (1833–1901) 23d president of U S H 273–7 *picture* H 273
administration (1889–93)
Bering Sea arbitration H 278 S 90
Blaine secretary of state B 205 H 276
Chilean controversy C 258 H 276
first forest reserve F 240
foreign policy H 276–7
Hawaiian annexation falls C 345
McKinley tariff H 275 M 17
Oklahoma settled O 363–4
Samoan troubles H 276
Sherman Anti Trust Act H 275 M 360
Sherman Silver Purchase Act H 275–6 277
six new states H 274 *table* U 254
ancestry H 274
defeated for re election C 344
wife W 128b
Harrison Caroline Scott (1832 92) wife of President Benjamin Harrison W 128b
Harrison Constance Cary (Mrs Burton Harrison) (1846–1920) novelist born Vaucluse Va (A Daughter of the South Old Fashioned Fairy Book Folk and Fairy Tales)
Harrison Frederic (1831–1923) English historian jurist literary critic

and positivist philosopher ('The Meaning of History'; 'Positive Evolution of Religion, 'The Choice of Books', 'Among My Books')
Harrison, Henry Sydnor (1880–1930), novelist born Sewanee, Tenn ('Queed' 'V V's Eyes')
Harrison, John (1693–1776), English inventor of devices for improving clocks and watches L-313
Harrison, (Lovell) Birge (1854–1929), painter, born Philadelphia best known for snow scenes and for paintings of city streets, especially skillful in depicting moonlight twilight, and misty atmosphere, author of 'Landscape Painting
Harrison, Ross Granville (born 1870), biologist and anatomist born Germantown, Pa, on faculty Johns Hopkins University 1896–1907 managing editor *Journal of Experimental Zoology* 1904–46, professor Yale University 1907–38 professor emeritus after 1938, chairman National Research Council 1938–46
Harrison, (Thomas) Alexander (1853–1930), genre landscape and sea painter, born Philadelphia Pa, lived most of life in Paris brother of L Birge Harrison noted for luminous color and delicate line
Harrison, Wallace K(irkman) (born 1895) architect born Worcester Mass, codesigner of Rockefeller Center, New York City and of trylon and perisphere theme structure of New York World's Fair (1939 and 1940), director of planning United Nations site New York City, 1947–52
United Nations buildings *pictures* A-400*f*, U-241
Harrison, William Henry (1773–1841) 9th president of U S H-277–8, *picture* H 277
dispute with Indians and battle of Tippecanoe H-278, T-34, *picture* T-33
presidential campaign H 278
War of 1812 H-278, W-13
wife W-127
Harrison, N J a suburb of Newark on the Passaic River pop 13 490 large pump elevator and steel plants, railroad center *map, inset* N-164
Harrisonburg, Va city 24 mi ne of Staunton, pop 10 810 turkey center poultry producing and processing textiles, Madison College and Eastern Mennonite College *map* V-486
Harrison Narcotic Act N-13
Harris Teachers College, at St Louis Mo city control opened 1857, arts and sciences education
Harris tweeds T-98
Harrod, James (1742–93?) pioneer and soldier born Pennsylvania, in 1774 founded first settlement in Kentucky at Harrodsburg opposed Richard Henderson and his Transylvania scheme took active part in wars against Indians, elected to Virginia legislature 1779, mysterious disappearance from his home led to belief that he was murdered
Harrodsburg, Ky county seat of Mercer County 60 mi sw of Louisville pop 5262, first settlement (1774) in Kentucky, location of Fort Harrod *map* K-31
early cabin, *picture* U-374
Harrogate, fashionable inland watering place in n England 15 mi n of Leeds, pop 50,454, medicinal springs *map* B-325
Harrow, farm implement *pictures* A-61, I-62
primitive type *picture* E-362
Harrow School, English school for boys at Harrow-on-the-Hill, 12 mi nw of London, founded 1571 E-262
Harry E Burroughs Newsboys Foundation, Boston Mass, established 1928 by Harry E Burroughs to raise cultural level of newsboy
Harry Hotspur. *See in Index* Percy, Sir Henry
Hart, Albert Bushnell (1854–1943), historian and educator born Clarksville Pa professor at Harvard 1883–1926 ('Formation of the Union Essentials of American History editor of 'American Nation series Epochs of American History')
Hart, John (1711?–79) Revolutionary War leader signer of Declaration of Independence born Stonington Conn
signature reproduced D 37
Hart, Lorenz (1895–1943) lyric writer for songs musical shows born New York City with Richard Rodgers composer turned out many 'hits *See also in Index* Rodgers Richard
Hart, Moss (born 1904) playwright born New York City with George S Kaufman wrote 'Merrily We Roll Along about a writer's loss of ideals 'You Can't Take It with You' comedy (Pulitzer prize 1937) 'I'd Rather Be Right musical comedy about New Deal 'The Man Who Came to Dinner' satire on celebrity worship
Hart, Nancy, American heroine of Revolutionary War among her many heroic deeds was the capture of six Tories who came to her cabin in Georgia and ordered her to prepare food highway through Georgia to Florida named for her
Hart, Sir Robert (1835–1911) Anglo-Chinese statesman as inspector general of imperial Chinese customs 1862–1907 placed Chinese national finance on solid footing
Hart, the mixture in the of the red deer
Harte, Bret, pen name of Francis Brett Harte (1836–1902), writer of Western stories H-278, A-229
Hartebeest, or **Hartbeest,** African antelope (*Bubalis cama*) about 4 ft high with long face and spreading horns curving back at tips grayish-brown (some species reddish), valued for hide and flesh
Hartford, Conn state capital and largest city in central part of state on Connecticut River pop. 177 397 H-279, C-448, 449, 450, *maps* C-445, U-253, *picture* C-437
Capitol State *picture* C-448
Charter Oak C-450, *picture* C-450
first school for deaf D-25
museum *See in Index* Museums, *table*
Hartford, George H *See in Index* Great Atlantic & Pacific Tea Company
Hartford Convention (1814) W-14
Harthacanute (*har-tha-la-nut'*) (1019–42) king of England son of Canute, ruled over Denmark and West Saxons while his brother, Harold I ruled in North succeeded him in 1040 brief reign marked by cruelty H-270
Hartlepool (*hart'l-pol*), England a borough and port on ne coast pop 17 217; adjoining is West Hartlepool (pop 72 597), coal iron ores, shipyards, iron-and-steel works *map* B-325
Hartley, David (1705–57), English philosopher, founded associationist school of psychology, held mind is a blank until written upon by sensations sensations being caused by vibration of the tiny particles of medullary substance of the nerves ('Observations on Man, His Frame, His Duty, and His Expectations')
Hartley, Fred A., Jr. (born 1903), U S representative from New Jersey, born Harrison, N J; 11 consecutive terms in Congress, coauthor of Labor-Management Relations Act of 1947 (Taft-Hartley Law)
Hartley, Marsden (1877–1943) artist and poet born Lewiston Me known for landscapes especially of Maine
'Mt Katahdin Autumn No 1' P-23*a*, *color picture* P-23*a*
Hartman, Gertrude (1876–1955), teacher and author, born Philadelphia Pa, writer of unusual factual books for children 'The World We Live In and How It Came to Be 'Medieval Days and Ways', 'Making of a Democracy', 'These United States and How They Came to Be
Hartmann, Karl Robert Eduard von (1842–1906), German philosopher taught that existence is evil and happiness an illusion ('Philosophy of the Unconscious')
Hartshorn, spirits of, old name for ammonia A-236
Hartwick College, at Oneonta NY established 1928 as outgrowth of Hartwick Seminary (opened 1797) Lutheran arts and sciences business administration music and music education nursing
Harty, Sir Herbert Hamilton (1879–1941) conductor, composer pianist born County Down Ireland, conducted London Symphony and Manchester Hallé orchestras and after 1932 conducted in Australia and U S ('Ode to a Nightingale', 'Irish Symphony')
Harun-al-Raschid, or **Haroun-al-Raschid** (*ha-roon'al-ra'shed*) (764?–809), Abbaside caliph of Baghdad 786–809 scholar, poet patron of learning literature and music, one of greatest princes of his day, but a poor administrator B-16
'Arabian Nights hero A-292
Haru'nobu, Suzuki (1724?–70?) Japanese painter one of the first great masters of the color print J-317
Harvard, John (1607–38), Puritan clergyman born London England, went to America 1637
Harvard University C-50
Harvard Mount (14 99 ft), one of the 'College' peaks in central Colorado
Harvard Classics E-329
Harvard University, the oldest institution of higher learning in U S founded 1636 at Cambridge Mass for men undergraduate college business school divinity school graduate school of arts and sciences, coeducational in design, education law medicine dental medicine public administration public health associated with Radcliffe College for women
Agassiz A-55–6
Arnold Arboretum B-261–2, *picture* B-261
football influenced by F-231
glass flowers in Botanical Museum, *color picture* R-145
Harvard House Stratford-on-Avon S-425
Longfellow L-309–10
Massachusetts Hall *picture* M-136
museums *See in Index* Museums *table*
observatories O-326, coronagraph *picture* O-326
President Eliot's influence E-329
Harvard University Library, oldest library in U S; formed 1638, including college and departmental collections is the third largest in U S, main collection housed in

Widener Memorial Library built 1914 in memory of Harry Elkins Widener a young bibliophile and Harvard alumnus who drowned in sinking of *Titanic* collections include parts of libraries of Longfellow James Russell Lowell and Amy Lowell fine theater collection L 197

Harvester ant A 256 257
jaws A 254

Harvest festivals T 110
England F 59
Thanksgiving T 110 *picture* F 58

Harvest fish *See in Index* Butterfish

Harvest fly a species of cicada C 306–7

Harvesting in agriculture F 26–7 97–8
alfalfa *picture* W 178
Brueghel's painting The Harvesters *color picture* F 28
carrot digging machine *picture* F 142*a*
combine harvester threshers T 124–5 A 59 *pictures* A 65 K 14 M 290 O 374 *color picture* F 34*a*
corn methods C 484 *pictures* A 64 I 29 *color pictures* F 34*a* U 248
cotton *See in Index* Cotton, soybean harvesting
grapes for wine *picture* G 91
guayule harvesting C 222*f*
hay by hand *picture* G 91 by hay rake *picture* F 70 by machine *picture* N 169
hemp harvesting H 333 *picture* H 333
inventions A 59
oats *picture* I 29
opium in China *picture* O 399
pineapples *picture* H 288
sugar beet harvesters *picture* A 63
threshing T 124–5
wheat harvesting W 115 *pictures* A 65 I 24 K 14 M 290 M 368 O 374 *color picture* I 34*a*

Harvestman *See in Index* Daddy longlegs

Harvest mite S 348

Harvest moon M 387

Harvest mouse M 441
foot *picture* F 225

Harvey Charles T (1829?–?) American civil engineer directed construction of first Sault Sainte Marie canal completed 1855 elevated railways B 430

Harvey Gabriel (1550?–1631?) English poet born Saffron Walden England made literary attacks on Robert Greene and Thomas Nashe attempted to introduce classical meters into English poetry

Harvey George Britton McClellan (1864–1928) editor and diplomat born Peachham Vt editor *North American Review Harper's Weekly Harvey's Weekly* ambassador to Great Britain 1921–3 Woodrow Wilson and W 144

Harvey William (1578–1657) English anatomist and physician H 279–80 *picture* H 279
circulation of blood M 165 B 210 A 239 H 279 280

Harvey Ill residential and industrial city near Calumet River 19 mi S of Chicago pop 20 683 highway machinery railway cars stoves diesel engines *map* Illinois I 36

Harwich (*har'ij*) England port on E coast 62 mi NE of London pop 13 488 fisheries shipbuilding naval station *map* B 325

Harz (*Harts*) Mountains in W-central Germany H 280 *map* G 88
canaries C 109
caves C 157
rainfall G 90 1
V bomb factory G 296

Hasa (*ha'sa*) district in E Arabia on Persian Gulf many springs hot and cold A 284 *map* A 285
Ibn Saud seizes A 290
oil well driller *picture* P 168

Hassan (*has'in*) and **Hussein** (*hu'sin'*) grandsons of Mohammed sons of Fatima and Ali killed AD 669 and 680 by adherents of the Ommayyad caliphs and revered as martyrs saints by the Shiites

Hasdrubal (died 207 BC) Carthaginian general son of Hamilcar Barca and brother of Hannibal slain at the Metaurus H 260

Hasenclever (*ha'zen-kla'ver*) **Walter** (1890–1940) German writer of expressionistic plays (The Son Beyond Marriages Are Made in Heaven)

Hashemite Jordan Kingdom *See in Index* Trans Jordan

Hashimite Kingdom of Jordan *See in Index* Trans Jordan

Hashish or **hasheesh** (*hash'ēsh*) also called **marihuana** a narcotic drug obtained from hemp N 13 H 333
assassins named from A 425

Hashishins or **Assassins** A 425

Haskell Institute nonreservation boarding school for Indians at Lawrence Kan founded 1884 maintained by U S government high school and post high school training in 25 vocations including commercial training building trades and mechanical trades

Hassam Childe (1859–1935) impressionist painter and etcher born Boston Mass known for landscape figure and seascapes remarkable colorist and skillful luminist (Summer Sea Lorelei The Church at Old Lyme)

Hassan ben Sabah (*has'in bin'sa'ba'*) (died 1124) founder of the sect of Assassins A 425

Hassler Hans Leo (1564–1612) German composer greatest of his age pupil of Andrea Gabrieli
tune used by Bach M 462

Hastat (*has'tat*) in Roman Legion W 9 *diagram* W 8

Hastie William Henry (born 1904) Negro lawyer educator and public official born Memphis Tenn dean of law Howard University 1939–46 governor Virgin Islands 1946–49 became first Negro judge U S Court of Appeals Oct 1949

Hastings Sue (born 1884) producer and director of marionettes born Monticello NY
marionettes P 441 *pictures* P 439–40

Hastings Thomas (1860–1929) architect born New York City entered into partnership with John M Carrère 1885 *See also in Index* Carrère John M

Hastings Warren (1732–1818) first governor general of India H 280
Burke and B 358 H 280

Hastings England port in Sussex popular watering place one of Cinque Ports pop 65 506 fisheries H 280 *map* B 325

Hastings Neb city about 90 mi W of Lincoln pop 20 211 farm implements metal products wheat meat and dairy products wood products textiles brick tile Hastings College State Hospital naval ammunition depot nearby N 106 *maps* N 103 U 252–3

Hastings battle of (1066) H 280
W 137

Hastings College at Hastings Neb Presbyterian opened 1883 arts and sciences business administration education music speech

Hatay The formerly the sanjak of **Alexandretta** geographically part of Syria after World War I under French mandate of Syria in 1939 France ceded the region to Turkey pop 296 277 1930 sq mi chief cities Alexandretta and Antioch

Hatch *See in Index* Nautical terms *table*

Hatch in fishing *net* F 118*b*

Hatch Act to prevent pernicious political activities (passed 1939 amended 1940) among its prohibitions are government employees or state employees who are paid in part from federal funds are forbidden to take part in political campaigns and to join any party or organization which advocates overthrow of the constitutional form of government in United States P 358

Hatcheries fish *See in Index* Fish culture

Hatchet a tool C 59 60 *pictograph* T 151

Hatchet foot a mollusk or **pelecypod** (*pē-lē'si-pŏd*) M 333 4

Hatchett Charles (1765–1847) English chemist discovered columbium

Hat dance a Mexican folk dance F 192*b–c*

Hathaway Anne (1556–1623) wife of William Shakespeare S 119 121
burial place S 425
cottage *picture* S 132

Hathor (*Hath'or*) ancient Egyptian goddess E 283 284

Hathorne William (1607?–81) Massachusetts colonial official and reformer born England lived in Salem from 1636 until his death ancestor of Nathaniel Hawthorne

Hats and caps H 281–2 *pictures* H 282 3 *See also in Index* Clothing, *special* headdress
Air Force Army Marine Corps and Navy U 235 *pictures* U 236
beaver B 92 F 303
Burma *picture* F 361
Chinese C 264 *pictures* C 265 274
choosing a hat D 151
curious facts about H 282
et quette F 404 405 H 282
felt H 281 *pictures* H 283
fez *picture* T 207 Turkish law forbids T 220*a*
Flemish (15th century) *color picture* F 25*a*
Gandhi cap I 62
Germany *pictures* B 83 M 100
Indo China I 124 *picture* I 125
Korea *picture* K 64*b*
Lapland *pictures* I 102 N 300
making H 281–2 *pictures* H 283
Norway *picture* N 300
Panama hats H 281 making H 281 *picture* L 111
Quaker H 282, *picture* A 192
sects and parties distinguished by H 282
shellac used to stiffen H 281
sombrero C 154 Mexican *pictures* M 198 207
styles period *pictures* D 146 147
Thailand (Siam) *picture* S 169
toppers English 19th century *picture* C 294
turban Afghan *picture* A 32 Arabian *pictures* A 286 289 Lalinese *picture* I 208 Burmese *picture* B 361 Chinese *picture* C 265 Greek *picture* G 192 Indian *pictures* I 58 59 68*b* Malayan *picture* F 208 South African *picture* S 243

United States manufactures H-281
"Hats" and "Caps," Swedish political parties H-282
Hatshepsut (*hăt-shĕp'sŭt*), queen of Egypt (1486–1468 B.C.) E-280
temple, *picture* E-284
Hat'teras, Cape, an easternmost island of North Carolina, separated from mainland by Pamlico Sound; many sailing ships wrecked in nearby waters: N-268, *maps* N-268, 275, U-253
lighthouse, *picture* N-268
Hattiesburg, Miss., city 87 mi. s.e. of Jackson, in yellow pine belt; pop. 29,474; chemicals, naval stores, clothing; Mississippi Southern College, Mississippi Woman's College· *maps* M-303, U-253
Hat'to (died 970), archbishop of Mainz: according to legend devoured by mice in "Mouse Tower" on Rhine, near Bingen.
Hau (*hou*), a small tree (*Hibiscus tiliaceus*) of the mallow family found in the tropics, wood used for boats; inner bark yields a rope fiber.
Hauff (*houf*), **Wilhelm** (1802–27), German novelist, short-story writer, and poet ('Lichtenstein', fine historical novel).
Hauptmann (*houpt'măn*), **Gerhart** (1862–1946), German dramatist; ran the gamut from Zolalike realism to mystic symbolism; awarded Nobel prize for literature 1912 ('The Weavers', 'The Sunken Bell', dramas; 'Atlantis' novel, 'Till Eulenspiegel', narrative poem): G-85, D-133, *picture* G-84
Hausa (*hou'sä*), Negro people of n. Nigeria; among most intelligent of central Africa, language spread through their activity as traders: N-236, *color picture* A-35
Hausegger (*hou:'zĕg-ĕr*), **Siegmund von** (1872–1948), German musical conductor and composer, born Gratz, Austria; conductor in Austrian and German cities; director, Academy of Music, Munich; symphonic poems, operas, choruses ('Barbarossa'; 'Wieland der Schmied'; 'Helfried'; 'Zinnober').
Haushofer (*hous'hō-fĕr*), **Karl** (1869–1946), German geographer, head of Geopolitical Institute at Munich; author of many works on geopolitics; influenced Hitler; committed suicide. *See also in Index* Geopolitics
Hausmannite (*hous'man-īt*), an ore of manganese, found as an oxide in brownish-black tetragonal crystals.
Haussmann (*ōs-măn'*), **George Eugène, Baron** (1809–91), French official and city planner; prefect of Seine 1853–70: P-85
Hautboy. *See in Index* Oboe
Haute-cloque. *See in Index* Leclerc, Jacques Philippe
Haute Savoie, France. *See in Index* Savoie
Haut Rhin (*ō răn*), department of France in the region called Alsace A-181
Haüy (*ä-ü-ē'*), **Valentin** (1745–1822), French teacher of the blind, born Saint-Just, France B-206
Havana (*hą-văn'a*), Spanish **Habana** (*ä-bä'nä*), capital of Cuba; largest and most important city in West Indies; pop. 787,448: H-282, 284, *maps* C-528, N-251, W-96, *pictures* C-526, H-284
yellow fever conquered M-403, G-142
Havana, Act of (1940) L-121–2
Havasu (*hăv'ą-sŏ*), **Lake**, on boundary between w. Arizona and s.e. California, formed by Parker Dam C-415, *maps* A-352, C-35, C-414*b*
Havasupai (*hä-vä-sŭ'pī*), a Yuman tribe of Indians living in Cataract Canyon of the Colorado River in n.w. Arizona.
Havelok the Dane, hero of old Anglo-Danish romance, son of Birkabeyn (or Gunter), king of Denmark; set adrift on raft which bore him to Lincolnshire coast, England, rescued by Grim, a fisherman; married ward of king of Lincoln, and became king of Denmark and of part of England. Grim was rewarded and built Grimsby
Havel (*hä'fĕl*) **River**, in n.-central Germany, a tributary of Elbe; rises in Mecklenburg and flows s., about 220 mi. long, linked by canals with the Oder Rhine and Elbe rivers: B-127, *map* G-88
Haverford College, at Haverford Pa.; Quaker for men, founded 1833; arts and sciences.
Havergal (*hăv'ĕr-găl*), **Frances Ridley** (1836–79) English hymn writer; daughter of evangelical clergyman in Worcestershire· began to scribble hymns at age of 7, simple expression of deep religious feeling ('Take My Life and Let It Be', 'Who Is on the Lord's Side').
Ha'verhill, Mass., industrial center on Merrimack River 33 mi. n. of Boston; pop. 47,280, shoe factories, scene of many Indian attacks· *map* M-133
birthplace of Whittier, *picture* M-130
Haviland, David (1814–79), china manufacturer, born Westchester County, New York; in 1842 established pottery at Limoges, France, and produced fine porcelain primarily for export to U.S.· in 1864 admitted as partners his sons, **Charles Edward Miller Haviland** (1839–1922), born Manhattan, N.Y., and **Theodore Haviland** (1842–1919), born Limoges, France; in 1892 Theodore withdrew and built at Limoges his own factory which is still in operation; American line of Haviland china produced in U.S. since 1936.
Havilland, Olivia Mary de. *See in Index* De Havilland, Olivia Mary
Havlicek (*hăv'lĕ-chĕk*), **Karel** (1821–56), Bohemian poet and political writer; editor of two Bohemian publications; imprisoned for liberal views, and died one year after release ('Tyrolese Elegies'; 'The Baptism of St. Vladimir').
Havre (*hăv'ĕr*), Mont., city 102 mi. n.e. of Great Falls, on Milk River; pop. 8086; farming; Northern Montana College: *maps* M-375, U-252
Havre, Le, France. *See in Index* Le Havre
Haw, fruit of the hawthorn H-294
Hawaii (*hą-wī'ē*), largest and southernmost of the Hawaiian Islands; 4021 sq. mi.; pop. 68,350; highest point Mauna Kea, 13,784 ft. The name Hawaii is commonly used to designate the entire group of Hawaiian Islands: H-288, *maps* H-286, P-17
Hawaii, University of, at Honolulu, Hawaii; territorial control; established 1907: arts and sciences, agriculture, applied science, business administration, education, nursing, social work; graduate school: H-290, *map* H-286
Hawaiian (*hą-wī'ăn* or *hą-wī'yăn*) **Islands**, formerly **Sandwich Islands**, a territory of the United States, in n. Pacific Ocean; 6407 sq. mi.; pop. 499,794; cap. Honolulu: H-285–91, *maps* H-286, P-17, *pictures* H-285, 287–90
agriculture H-288, 288*a*: irrigation H-287, *picture* H-287; percentage of land used H-286; pineapple P-259, H-288, 288*a*, 289, *picture* H-288; rice H-288*a*; sugar H-288, 288*a*, 289, *picture* H-287
animals H-288*b*
bird life H-288*b*–9
cemetery, U.S. national N-16*b*
cities, *list* H-285. *See also in Index* names of cities
climate H-286–7
clothing: in old Hawaii H-288*b*
commerce H-289: 19th century H-290, 291, *picture* H-290
communication H-290
dance· hula dance H-288*b*, *picture* H-289; in old Hawaii H-289
education H-290: in old Hawaii H-289
flag F-130, *color picture* F-126
food H-288*b*, *pictures* H-289, P-14
forests, state *See in Index* Forests and forestry, *table*
government H-290
history H-290–1: Capt. James Cook and his explorations C-462, H-290, *picture* C-462; Honolulu harbor in 1882, *picture* H-290; early U.S. interest P-13; U. S. defense base H-291; World War II H-286, 291, W-259, W-285; statehood H-285
industry H-286, 289
irrigation H-287, *picture* H-287
language H-288*a*, *b*: Hawaiian language H-289
libraries and museums H-290
natural features H-285–8*a*
park N-35, H-288, *map* N-18
people H-288*a*: children in old Hawaii H-289; how modern people live H-288*a*–*b*, *pictures* H-287–8, 288*b*–9; how the early people lived H-288*b*–9
plants H-287, 288, 288*a*, *b*, *pictures* H-288*a*: orchids H-288
products H-288, 288*b*, 289, *list* H-285
religion: work of missionaries H-291
shelter: in old Hawaii H-288*b*
sports H-288*b*, *picture* H-288*b*: of old Hawaii H-289
strategic location H-286
transportation H-289–90
volcanoes H-286, 288, picture H-287. *See also in Index* Volcanoes, *subhead* Hawaiian Islands, *also* volcanoes by name
Hawaii National Park N-35, H-288, *map* N-18. *See also in Index* Haleakala; Kilauea; Mauna Loa
Hawes, Charles Boardman (1889–1923), author, born Clifton Springs, N.Y.: sea romances for young people; Newbery medal for 'The Dark Frigate', 1924 ('The Mutineers'; 'Great Quest').
Hawes, Silas, American inventor; patented the carpenter's square.
Hawes, Stephen (1475–1530), English poet ('Passetyme of Pleasure' and 'Example of Virtue', allegorical poems).
Hawfinch, European grosbeak G-219
Hawk H-291–3, *pictures* H-291–3, B-159, *color picture* B-181
buzzard hawks H-292
falconry F-14–15, *picture* F-14
head, *color picture* B-176
injurious and beneficial B-158, 159
nest B-172, *picture* B-173
skeleton, *picture* S-191
Hawker, Harry G. (1889–1921), Australian aviator, first to try Newfoundland-to-London flight (May 1919); landed in midocean, rescued by Danish ship; killed in plane crash near London, England, July 1921.
Hawkesbury, Ontario, Canada, town on Ottawa River 55 mi. e. of

Ottawa pop 7194 lumber pulp and paper mills *map* C 72

Hawkeye *See in Index* Pumpkin Patty

Hawkeye State pop lar name for Iowa

Hawking or **falconry** F 14–15 *picture* F 14

Hawkins Sir Anthony Hope *See in Index* Hope Anthony

Hawkins or **Hawkyns Sir John** (1532–95) English adventurer and admiral H 293–4
voyages to America A 190 H 293 4

Hawkins John Isaac inventor of up *right piano* P 249

Hawkins Sir Richard (1562–1622) English admiral son of Sir John commanded vessel in attack on the Spanish Armada commanded an expedition to South America 1 8 – 97 but was captured by Spanish and imprisoned until 16 2 later served in Parliament H 294

Hawk moth *See in Index* Sphinx moth

Hawks Frank Monroe (1896–1938) aviator born Marshalltown Iowa in U S Army air service 1917–19 his numerous speed records include transcontinental nonstop flights killed in plane crash

Hawks beard a plant *See in Index* Crepis

Hawksbill or **hawkbill** a sea turtle (*Eretmochelys imbricata*) T 222 224 T 158

Hawksbill Head in Shenandoah National Park V 38b

Hawksbury Castle *See in Index* Hawksbury

Hawksmoor Nicholas (1661 1736) English architect worked so intimately with Christopher Wren that it is impossible to make exact division of credit for their work
Westminster Abbey towers W 99

Hawkweed a genus of perennial plants (*Hieracium*) of the family *Compositae* with loosely clustered yellow orange or white flower heads and oblong toothed leaves that grow from roots in rosette trouble some weed in some places an old superstition stated that hawks used the sap to sharpen their eyesight
orange or tawny or lev ls paint brush *color picture* P 175

Hawley Smoot Tariff Act introduced by Representative Willis C Hawley (1864–1941) of Oregon and Senator Reed Smoot (1862 1941) of Utah passed in June 1930 greatly increased import duties on many agricultural and manufactured products other nations retaliated by discriminating against imports from the U S

Haworth (*hō wurth*) England urban district and village 8 mi nw of Bradford beautiful moorlands famous as home and burial place of Charlotte Emily and Anne Bronte Bronte museum and library woolen manufactures

Hawser *See in Index* Nautical terms *table*

Haw thorn an ornamental shrub H 294
flower H 294 state flower of Missouri *color picture* S 384a
hedges H 323

Hawthorne Charles Webster (1872 1930) painter born Lodi Ill spent boyhood in Maine well known for his figure paintings of Cape Cod and Provincetown fishermen

Hawthorne Hildegarde (1871–1952) poet and author born New York City daughter of Julian and granddaughter of Nathaniel Hawthorne published first book in 1904 books for children based on original sources and personal reminiscences of her father Romantic Rebel the Story of Nathaniel Hawthorne Youth s Captain the Story of Ralph Waldo Emerson The Happy Autocrat a Life of Oliver Wendell Holmes Concord s Happy Rebel Henry David Thoreau

Hawthorne Julian (1846 1934) civil engineer and author born Boston Mass son of Nathaniel Hawthorne (Garth Sebastian Strome novels Hawthorne and His Circle)

Hawthorne Nathaniel (1804 64) American novelist H 294–5 A 227 picture H 294
Hall of Fame table H 949
home in Concord C 430 *picture* M 130
House of the Seven Gables *picture* M 130
quotation Shakespeare S 127
Salem Mass *pictures* M 130
Wonder Book I 273

Hawthorne Calif city 11 mi sw of Los Angeles pop 16 aircraft airplane parts water heater luggage prod growing airport El Camino College Northrop Aeronautical Institute *map* set C 35

Hawthorne N J a borough on Passaic River 3 mi n of Paterson pop 14 616 stockings textile dyeing and printing *map* N 164

Hay Ian *See in Index* Beith John Hay

Hay John (1838–1905) statesman diplomat and writer born Salem Ind M 19 20 C 280 *picture* M 19
open door policy in China C 282 M 19

Hay dried grass or other plants used as fodder H 295 *See also in Index* Forage crops
harvesting 4 60 F 26–7 *pictures* F 32b F 70 G 91 N 162
plants used for alfalfa A 151
clover C 309 60 millet M 256
peanut P 104 timothy A 63 picture A 151
mower machine *picture* F 27

Hayden Ferdinand V (1829–87) geologist born Westfield Mass professor of geology University of Pennsylvania director of geological survey of Western territories N 19

Haydn (*hīd n* German *hī dn*) **Franz Joseph** (1732 1809) Austrian composer H 293 M 462 3
Austrian national hymn N 41

Haydon Benjamin Robert (1786 1846) English writer and historical painter (Autobiography and Journals)

Hayes Helen (born 1900) actress born Washington D C debut at age of six early successes included Dear Brutus with William Gillette distinguished for charm and dramatic skill on stage in motion pictures on radio and on television (stage plays Bab Mary of Scotland and Victoria Regina films The Sin of Madelon Claudet for which she won Academy award for 1932 Arrowsmith and My Son John) married Charles MacArthur 1928
in Victoria Regina *picture* D 135

Hayes Lucy Webb (1831–89) wife of President Hayes W 128a

Hayes Patrick Joseph Cardinal (1867 – 1938) Roman Catholic prelate born New York City president Cathedral College New York City 1909 14 appointed Catholic chaplain bishop for U S Army and Navy 1917 and archbishop of New York 1919 created cardinal 1924

Hayes Roland (born 1887) Negro tenor born Curryville Ga concert tours in U S and Europe noted for singing of Negro spirituals sang with Boston New York and other leading symphonies Springarn medal 1925 author of My Songs

Hayes Rutherford Birchard (1822–93) 19th president of U S H 296 9 *picture* H 296
administration (1877 81) H 297–9
Arrears of Pensions Bill H 299
Bland Allison Act H 298
Chinese immigration treaty A 391 I 48
civil service reform H 297
Greenback party H 298
reconstruction ended R 86 H 297
resumption of specie payments H 297 298 M 338
Civil War service H 296
election dispute H 296–7 L 334
wife W 128a

Hayes River Manitoba Canada rises near Lake Winnipeg and flows 300 mi to Hudson Bay *maps* C 68–9 81

Hay fever catarrhal affection of mucous membranes of eyes nose mouth and bronchi recurring annually in late summer months caused by pollen of various plants such as ragweed and affecting only individuals sensitive to these pollens Name used also for sensitiveness to plant and animal proteins other than pollens

Haymarket riot at Chicago C 238

Hayne Paul Hamilton (1830–86) poet born Charleston S C nephew of Robert Young Hayne called the laureate of the South (Legends and Lyrics The Mountain of the Lovers) A 228

Hayne Robert Young (1791 1839) statesman born South Carolina ardent nullification advocate best remembered as having elicited 1830 Webster s Reply to Hayne
Webster Hayne debate F 287 W 82

Haynes Elwood (1857–1925) inventor born Portland Ind *table* A 505
Haynes automobile *picture* A 506

Hay Pwun efote (*pqns fōt*) **Treaty** (1901) between U S and Great Britain M 20
Wilson and W 148

Hays Arthur Garfield (1881–1954) lawyer and writer born Rochester N Y began practice New York City 1906 in civil liberties cases famous cases include Scopes and Sacco Vanzetti (Enemy Property in America Let Freedom Ring Democracy Works City Lawyer autobiography)

Hays Charles Melville (1856–1912) railroad official born Rock Island Ill began railroading at 17 served with several companies becoming president Grand Trunk Railway Co of Canada 1910 died in *Titanic* disaster

Hays Will H (1879–1954) lawyer born Sullivan Ind U S postmaster general 1921 22 served as president Motion Picture Producers and Distributors of America 1922–45 advisor 1945 50

Hayward Calif city 13 mi se of Oakland pop 14 272 nurseries apricots tomatoes poultry processed foods glass products motor coaches salt airport *map* inset C 34

Haywood Carolyn (born 1898) illustrator and author of children s books born Philadelphia noted for portraits of children books Betsy and Billy Here s a Penny Little Eddie and Gardenia

Hazaras (*hā zə rəs*) Afghan tribe of Mongolian origin A 31

Hazard in golf C 136

Haze an atmospheric condition caused

by suspension of fine particles in the air, making it less clear Unlike fog which depends on moisture haze is often present when atmosphere is dry
Hazel, bushy shrub related to the birches H-299
Hazel Park, Mich city 9 mi n w of Detroit, pop 17,770 *map, insct* M-227
Hazeltine, Louis A., American inventor R-43
Hazen, Charles Downer (1868–1941) educator and writer born Barnet Vt, professor history Smith College 1894–1914 Columbia University after 1916 ('The French Revolution and Napoleon' 'Modern Europe' 'Alsace Lorraine under German Rule')
Hazen, William Babcock (1830–87), U S Army officer born West Hartford Vt in Army service 1855 until death chief signal officer 1880–87 except during his court-martial (1885) for criticism of delay in relieving Greely expedition which he had organized 1881 (*see in Index* Greely) important advances in weather forecasting during his service as chief signal officer
Hazing, in colleges and other schools, the infliction of indignities and severe practical jokes upon newcomers by upperclassmen sometimes involves serious injury
Hazleton, Pa summer resort and industrial center 20 mi s of Wilkes-Barre pop 35 491 anthracite interests silk clothing steel and iron products *map* P-133
Hazlitt, William (1778–1830) English critic and one of greatest English essayists whatever his theme he derives the essence of his commentary from himself being in turn metaphysician moralist, humorist painter of manners and characteristics, friend of Lamb ('Characters of Shakespeare's Plays' 'Lectures on the English Poets, 'Table Talk') E-380, L-98*c*
H-bomb A-467–9
H. D. *See in Index* Doolittle Hilda
H'Doubler (*do'blēr*), **Margaret** (Mrs Wayne Claxton) (born 1889) educator born Beloit Kan, joined physical education staff University of Wisconsin 1910 professor since 1942, developed first dance major course in a university, wrote books on dance
students at University of Wisconsin, *pictures* D-14–14*a*
Head, Sir Edmund Walker, Baronet (1805–68), English writer on art and colonial government, lieutenant governor of New Brunswick 1847–54, governor general of Canada 1854–61
Head, Sir Francis Bond, Baronet (1793–1875) English soldier, author and colonial governor, served in Waterloo campaign, managed gold and silver mines in South America, lieutenant governor of upper Canada 1835–37, wrote 'Bubbles from the Brunnens of Nassau', 'Highways and Dryways', 'Stokers and Pokers'
Head *See also in Index* Brain, Skull proportion to rest of body *chart* C-240*a*
Head, or inning, in curling C-530
Head, nautical *See in Index* Nautical terms *table*
Headband, in bookbinding B-245
Headdress. *See in Index* Clothing, *subhead* headdress, Hats and caps
Header, in brick masonry B-304
Headfish, fish belonging to *Molidae* family, including the ocean sunfish *See in Index* Sunfish
Head-footed mollusks, or cephalopods M-333
Head-hunters
Borneo B-254, E-205
Burma B-359
Ecuador S-262
New Guinea N-142
Heading. *See in Index* Nautical terms, *table*
Headlock, wrestling term, *picture* W-306
Head louse, egg *picture* E-269
Headquarters, U S Air Force A-80
Headsail. *See in Index* Nautical terms *table*
Heald rod in weaving S-351
Health H-300–7, *pictures* H-300–1, 307. *See also in Index* Hygiene Public health
Health, Education, and Welfare, Department of, U S U-367, list U-359, *pictograph* H-309
building *map* W-30
Health, goddess of (Hygeia) H-300
Health, god of (Apollo) H-300
Health, National Institute of *See in Index* National Institute of Health
Health Department H-308–10, *graph* H-309 *See also in Index* Hygiene Public health
Health insurance S-218*a*
health and accident insurance I-168*b*
Healy, George P A (1808–94) portrait painter born Boston (portraits of Webster Clay Calhoun and U S presidents from John Quincy Adams to Lincoln)
Healy, Timothy Michael (1855–1931) Irish leader self-educated through his fiery brilliant eloquence won many reforms for Ireland first governor general Irish Free State, 1922–28 ('The Great Fraud of Ulster', 'The Planters' Progress')
Hearing E-170–1 *See also in Index* Deaf Ear Sound
childhood C-240*a–b*
Hearing aids D-26
Hearn (*hērn*) **Lafcadio** (1850–1904), author born Ionian Islands, son of Irish army doctor and Greek mother, married a Japanese and became a citizen of Japan, picturesque writing ('Chita 'American Miscellany' 'Kotto' 'Glimpses of Unfamiliar Japan, 'In Ghostly Japan')
'Japanese Fairy Tales' S-409
Hearne, Samuel (1745–92), English explorer, in service with Hudson's Bay Company, discovered copper mines of Coppermine River basin in Northwest Territory and traced that river to Arctic Ocean, being first white man to reach the Arctic overland from Hudson Bay C-96
Hearsay, in law *See in Index* Law, *table* of legal terms
Hearst, Phoebe Apperson (1842–1919), philanthropist mother of William Randolph Hearst, born near St James Mo, her gifts included kindergartens kindergarten training schools, public libraries paid cost of architectural competition for University of California, there built and equipped Hearst Memorial Mining Building
National Congress of Mothers P-80
Hearst, William Randolph (1863–1951), capitalist and journalist born San Francisco, owner of string of newspapers from San Francisco to New York and of a block of magazines exponent of sensational journalism, member of U S House of Representatives 1903–7
Heart H-311–14, *color pictures* H-311–14, P-240–2. *See also in Index* Circulation
amphibians R-110
artificial, perfected by Alexis Carrel and Charles Lindbergh L-253
disease D-105, H-314
drugs stimulate adrenalin D-156; strychnine S-432
electrocardiograph H-314, *picture* D-104
fibers H-313 M-453
insects I-154
pulse P-435 H-313
reptiles R-110
'Heart of Midlothian, The', novel by Sir Walter Scott S-69
Heart River, North Dakota tributary of Missouri *maps* N-282, 288
Heartsease, another name for the pansy P-64
Heart-shape cut, in diamond cutting *picture* D-79
Heartwing sorrel, herb of genus *Rumex, color picture* F-179
Heartwood, of trees T-179, W-186
Heat H 315–20, *pictures* H-315–19, *Reference Outline* P-237. *See also in Index* Heating and Ventilating Temperature
absorption H 316; land and water compared C-349
alloys changed by A-175
animal production B-146
atomic source H-316
conduction H-316, H-321
convection H-318
crystals affected by C-525, A-175
electric current caused by E-302, *diagram* E-294
electric furnace F-316–17
electricity produces E-302–3
evaporation E-449
fire F-73–4
fuel F 313–15, *chart* F 314
fusion latent heat of H-319, W-63, F-283
gems treated with J-348, 349
high temperatures Bunsen burner B-353, climate C-350, D-26; electric furnace F-316–17; sandy surfaces in desert S-15, thermite A-183
history of theories P-232–3, H-320
infrared rays I-148–9. *See also in Index* Infrared radiation
ionizes gases E-315
latent W-63, F-283, H-319
life influenced *color picture* F-212
lowest temperature produced H-319
measurement H-318–19· calorimeters B-352, heat units H-319, C-49, pyrometers P-447–8, spectroscopes S-333, S-373; thermometers H-318–19, T-116–17, *picture* T-116
melting point· *table* F-284
molecular motion causes H-316–17, E-344*a*, W-63
oxyacetylene flame A-7, 8
oxyhydrogen flame H-459
pyrometers measure high temperatures P-447–8
quantity H-317. measured in calories C-49
radiant H-318, R-30*d*, E-344*c*, *diagram* E-344*c*
reflecting H-318
resisting materials *See in Index* Heat-resisting materials
sources H-315–16
specific H-319; of water W-60
spectroscope measures S-373, S-333
star A-442
sun S-450, 452–3, H-315· factor in climate C-348–9, *diagram* C-349, solar constant studies C-351, spectroscope measures S-333
thermite A-183
thermometers T-116–17, H-318–19, *picture* T-116
transmission methods H-318
vacuum an insulator, *picture* V-434
vaporization, latent heat of H-319, W-63
warmth sense of T-158· how animals keep warm A-250*d–1*
waves in physics H-318

Heat engines machines which convert heat into mechanical energy *See in Index* Diesel engine Internal combustion engine Steam engine
Heat exhaustion or **heat prostration** *first aid for* F 96a–b
Heath (*hēth*) a small evergreen shrub related to heather name often applied to heather
Heath a sterile area covered by low shrubs usually conifers and heaths may be either excessively dry or excessively wet F 348
Heathcoat (*hēth kōt*) **John** (1783–1861) inventor born Duffield near Derby England invented important lacemaking machinery
Heathcote Caleb (1666–1721) colonial merchant and public official born Derbyshire England came to New York in 1692 life member of governor's council judge of Westchester County mayor of New York City 1711 19 large landowner helped establish Anglicanism in Connecticut and New York
Heathen Chinee The a poem by Bret Harte H 278
Heather or **ling** an evergreen shrub with bell like flowers H 320
Heath family or **Ericaceae** (*ē ri kā' sē ē*) a family of shrubs and trees of wide distribution including the madron strawberry tree sourwood rhododendron kalmia bearberry huckleberry blueberry cranberry and trailing arbutus
Heath hen a grouse (*Tympanuchus cupido*) similar to prairie chicken but smaller inhabited wooded regions of central and s New England also called eastern prairie chicken now extinct B 182
Heating and ventilating H 321–6 *pictures* H 321–5
air conditioning A 77–8 *pictures* A 77 8
American Colonies *See in Index* American Colonies *subhead* heating methods
ancient S 144a S 424
atomic heating *picture* E 373
best temperature and humidity W 200
Boise Idaho natural hot water supply I 14
central or district heating H 324
chimneys invention S 424
electric heating H 321
fireplaces S 424 *See also in Index* Fireplace
fresh air supply average W 200
fuel F 313–15 H 322 *chart* F 314
gas heating H 323
hot water heating H 321 322 323 324 325
humidity A 77 78 E 450 *humidifier on furnace* H 323 *pictures* H 322
hygrometer measures H 461
Iceland hot springs used I 10
insulating materials aluminum A 182 asbestos A 401 cork C 480 gypsum G 236 precast concrete *picture* C 431b terra cotta B 344
medieval castles S 144a
oil *heating* H 322
poison gas from stoves and furnaces H 304
Pompeian baths P 367
radiant or panel heating H 325–6 *picture* H 324
regulation automatic H 326 air conditioning A 77–8 *pictures* A 77–8
Roman house *picture* S 424
steam heating H 321 322 324 325
stoves S 424 *pictures* S 424 Franklin S 424 I 280a *picture* A 216
thermostats H 326 T 117
vacuum vapor system H 324
vacuum system H 324
vapor system H 324
warm air or hot-air heating H 321–2 323 324
windows B 346
Heating element of electrical apparatus A 174
Heat lightning L 241
Heat pump method of heating houses H 326 *picture* H 325
Heat rays a popular name sometimes given to infrared rays
Heat resisting materials
asbestos A 401
carborundum S 180
chromium C 301
fiberfrax insulation F 304
glassware G 122b
graphite C 156
plate glass G 122
platinum P 314
tungsten T 208
Heatstroke or **sunstroke** *first aid for* F 96a
Heave *See in Index* Nautical terms *table*
Heaven the place or state of righteous souls after death
Dante's D 15
Elysian Fields H 241
Heavenly Twins *See in Index* Gemini
Heave to *See in Index* Nautical terms *table*
Heaviside Oliver (1850–1925) English physicist born London did foundation work for long distance telephoning suggested that there was an electrical ceiling also called Heaviside layer
Heaviside layer *See in Index* Kennelly Heaviside layer
Heavy hydrogen H 459 *pictures* R 54a
Heavy oxygen O 436 A 462
Heavysege (*hē vī sēj'*) **Charles** (1816–76) Canadian poet born England wrote Saul a poetic drama original in conception and containing passages of great beauty
Heavy soil S 228
Heavy water H 459 W 64
Heavyweight
in boxing B 287 *champions* B 271–2 *table* B 272
in wrestling W 305
Hebbel (**Christian**) **Friedrich** (1813–63) German poet and dramatist one of greatest in 19th century work shows skill in characterization and true feeling for dramatic situations but is marred by occasional extravagances (Judith Herodes und Marianne)
Hebe (*hē' bē*) in Greek mythology cupbearer to gods H 326
Hebenstretia (*hē ben strē' shi ą*) a genus of South African perennial plants of the figwort family One species (*H comosa*) grown as annual stems woody flowers in 6 in spikes yellow or white blotched orange red like mignonette fragrant at night
Heber Reginald (1783–1826) English churchman and hymn writer *bishop of Calcutta* (*Holy Holy Holy Lord God Almighty* From Greenland's Icy Mountains)
Hébert (*a bĕr'*) **Jacques René** (1755–94) *French revolutionist* atheist guillotined F 163
Hébert Louis (died 1627) Canadian colonist born Paris France apothecary at French court emigrated to Acadia 1604 where he cultivated herbs and engaged in farming Hence is known as first Canadian farmer moved to Quebec 1617 many old French Canadian families trace lineage to him C 95a
Hébert Louis Philippe (1850–1917) Canadian sculptor noted for statues of prominent Canadians
Hebrew language and literature H 326–7
alphabet H 326 A 179 Gezer calendar *table* A 178 *See also in In lex Alphabet table*
Bible B 133–7 *pictures* B 133–7 *Talmud* H 327
Hebrews or **Jews** J 351 4 *pictures* J 351–4 *See also in In lex* Jews
Hebrews Epistle to the the 19th book of the New Testament a letter addressed to Christians of Hebrew birth probably those living at Rome about A D 65 The author ship is unknown but frequently attributed to Paul
Hebrew University institution of higher learning in Jerusalem on Mt Scopus founded mainly by the Zionist organization opened 1925 science Jewish and Oriental studies humanities medicine law and agriculture instruction is in Hebrew language *pictures* J 337
Hebrides (*heb ri dēz'*) **Islands** also *Western Isles group of more than* 500 islands off the w coast of Scotland 2812 sq mi pop 53 456 H 327 *map* B 324
surrendered to Scotland T 120
Hebron (*he bron*) one of oldest cities of Palestine 18 mi s of Jerusalem pop 26 390 Abraham's tomb here *maps* P 45 I 258
Hecate (*hĕk' ą tē*) in Greek mythology H 328
Hecatomb (*hek' ą tōm* or *hĕk' ą tom*) in modern usage the destruction of a large number of things originally in ancient Greece sacrifice of 100 oxen (from *Hekaton* Greek for hundred) later sacrifice of any large number
Hecatompedon temple in ancient Athens A 11
Hecht Ben (born 1894) author born New York City (Erik Dorn Gargoyles 1001 Afternoons in Chicago The Front Page play with Charles MacArthur)
Hecker Isaac Thomas (1819–88) Roman Catholic priest born New York City member Brook Farm Experiment 1844 converted to Catholicism in 1844 and in 1858 founded Missionary Society of St Paul the Apostle (Paulists)
Heckscher Foundation established 1921 by gift of Mr and Mrs August Heckscher to promote child welfare especially in New York State
Hecla volcano in Iceland *See in Index* Hekla
Hectare or **hektare** a unit of measurement M 184
Hectograph a duplicating process P 414c
Hector in Greek mythology son of Priam H 328–9 *pictures* H 328
Priam recovers Hector's body *H 329 picture* A 9
Hector Sir knight in Arthurian legends A 994
Hecuba (*hek' ū bą*) in Greek mythology *wife of Priam H 329* dream before birth of Paris P 80
Hedda Gabler (*hĕd' ą gą blĕr'*) play by Ibsen its heroine is one of the most hateful and unscrupulous egoists of literature
Heddle in weaving S 351 *picture* S 351
Hedge H 329 G 15
Eng and L 351 *picture* E 350
in formal garden *pictures* A 400g
Hedgehog a spiny animal H 329 *picture* H 329
porcupine sometimes called P 374
Hedgehog cactus *color picture* C 12
Hedge nettle *See in In lex* Stachys
Hedges Cornelius early governor of Montana N 18
Hedging in economics B 214

Hedin (*hē-dēn'*), **Sven A.** (1865–1952), Swedish explorer; explored e. Turkestan, Tibet, Mongolia, and Siberia; found valuable treasures of natural science in Sinkiang province, China ('Through Asia'; 'Scientific Results of a Journey in Central Asia'; 'From Pole to Pole'; 'A Conquest of Tibet').
Hedjaz, Saudi Arabia. *See in Index* Hejaz
Hedley, William (1779–1843), British inventor L-291
Hedonists (*hē'dŏn-ists*), a school of philosophers P-203
Heel, in anatomy
Achilles' heel A-8, 9
human and animal F-224
Heel, nautical. *See in Index* Nautical terms, *table*
Heel fly, a botfly that attacks the heels of domestic animals F-189
Heeling calves, at round-up C-149
Heep, Uriah, in Dickens' 'David Copperfield' a malignant hypocrite who pretends to be so "very 'umble", *picture* D-84*b*
Hegel (*hā'gĕl*), **Georg Wilhelm Friedrich** (1770–1831), German philosopher; professor of philosophy at Heidelberg and University of Berlin; founder of the school of absolute idealism.
Heg'enberger, Albert F. (born 1895), aviator, born Boston, Mass., *table* A-104
Heggen, Thomas Orlo (1919–49), author, born Fort Dodge, Iowa; member editorial staff *Reader's Digest;* with U.S. Navy in South Pacific, World War II; 'Mister Roberts', his novel about life on a Navy supply ship, was basis of play 'Mister Roberts', of which he was coauthor with Joshua Logan.
Hegira (*hē-jī'rą*), Mohammed's flight from Mecca (A.D. 622), from which Moslem dates are calculated M-329
Heiberg (*hī'bĕrĸ*), **Johann Ludwig** (1791–1860), Danish poet and critic; edited *Flying Post;* championed Hegelian philosophy ('A Soul After Death'; 'The Newly Wedded'; 'The Nut-Cracker').
Heidelberg (*hī'dĕl-bûrg̃*), Germany, university city on Neckar River; pop. 116,488: H-329–30, *maps* G-88, E-425
Heidelberg, University of, Germany H-329–30, U-404
library, *picture* G-101
Heidelberg College, at Tiffin, Ohio; founded 1850 by Reformed church; arts and sciences, music.
Heidelberg man M-69–70
Heidenstam (*hī'dĕn-stăm*), **(Karl Gustaf) Verner von** (1859–1940), Swedish poet and miscellaneous writer; won Nobel prize 1916 ('Hans Alienus', fanciful epic; 'Birth of God', 'The Soothsayer', dramas; 'The Charles Men', stories of Charles XII of Sweden and his wars; 'Nya Dikter', poems).
Heifer C-141, 141*a*
Heifetz (*hī'fĕts*), **Jascha** (born 1901), American violinist, born Vilna (now Vilnius), Russia; graduated Royal School of Music at Vilna, at age of 8; made first public appearance at 5 and before he was 18 had won recognition throughout world as master of violin; debut in United States 1917.
Height, stature
growing child C-240*a*, A-22 *chart* C-240*a*
individual differences I-114
racial characteristics A-264
Height of Land, in Canada L-137
Heights and depths. *See in Index* Altitude; Depth
Heijermans (*hī'ĕr-măns*), **Herman** (1864–1924), Dutch writer of Jewish parentage; first became known through sketches of Jewish family life under pen name of "Samuel Falkland"; wrote several notable plays ('The Good Hope'; 'Rising Sun'; 'The Ghetto'; 'Links'; 'A Case of Arson').
Heijo, Korea. *See in Index* Pyongyang
Heilbronn (*hīl'brŏn*), town in s. Germany on Neckar River, 25 mi. n of Stuttgart; pop 64,643; machinery, furniture, metal goods, paper, wooden goods; fine Gothic church and Rathaus *maps* G-88, E-425
Heilprin (*hīl'prĭn*), **Angelo** (1853–1907), American naturalist and traveler, born Hungary; professor invertebrate paleontology and geology, Academy of Natural Sciences, Philadelphia; made valuable investigations in Florida, Bermuda, Martinique, climbed crater of Mt. Pelée while volcano was erupting; chief editor *Lippincott's Pronouncing Gazetteer* (1905).
Heilsberg (*hīls'bĕrĸ*), Poland, former German (East Prussian) town about 80 mi. e. of Danzig; indecisive battle between French and allied Russians and Prussians 1807; included in Poland since 1945.
Heilungkiang (*hā'lŭng'gī-äng'*), province of n. central Manchuria; area about 130,000 sq mi.; pop 6,000,000; cap. Lungkiang (Tsitsihar); timber, gold, coal; soybean and flour mills and distilleries; much larger than now, Heilungkiang historically formed, with Kirin and Liaoning, the Three Eastern Provinces of Greater China: M-72, 76
Heimdal (*hām-dal'*), in Norse mythology, guardian of the rainbow bridge of the gods; can see perfectly day and night; can even hear grass grow; seldom sleeps: M-476*c*, *picture* M-476*d*
Heine (*hī'nĕ*), **Heinrich** (1797–1856), German poet H-330, G-85, *picture* G-82
Heinlein, Robert Anson (born 1907), author and scientist, born Butler, Mo.; graduated from U.S. Naval Academy; in Navy in World War II; wrote his first science fiction short story in 1939. His books for boys include 'Rocket Ship Galileo', 'Red Planet', 'Farmer in the Sky', and 'The Rolling Stones'.
Heir (*ĕr*), or **heiress**, from Latin word *heres*, a person who is entitled to inherit. *See also in Index* Law, *table* of legal terms
Heir apparent, one who will inherit if he outlives ancestor, as eldest son.
Heir presumptive, one who will inherit if no nearer heir is born to ancestor.
Heisenberg (*hī'zĕn-bĕrĸ*), **Werner** (born 1901), German physicist; professor of theoretic physics University of Leipzig after 1927; in 1932 awarded Nobel prize in physics for work in quantum mechanics: P-236
Heisman Memorial Trophy, awarded to most valuable college football player of year. Originated by Downtown Athletic Club of New York City in 1935 in honor of John W. Heisman, player and coach for 40 years.
Hejaz (*hĕj-ăz'*), or **Hedjaz**, part of the kingdom of Saudi Arabia; a separate kingdom from 1919 to 1925, when it was conquered by Ibn Saud; area about 150,000 sq. mi.; pop. about 1,500,000; chief cities Mecca, Jidda, Medina: A-284, *map* A-285
gold mining A-288
Mecca M-157
Hek'la, or **Hecla**, a volcano in s.w. Iceland; height 5100 ft.; becomes active at irregular intervals: *map* E-416, *picture* I-10*b*
Hektare. *See in Index* Hectare
Hek'togram, a unit in metric system (3.527 oz.) M-184
Hektograph, office appliance for reproducing letters and other documents; original writing is transferred to a moist gelatin or clay surface by use of special ink, and from this the impression is transferred to blank, dry paper; used for relatively few copies.
Hek'toliter, a unit in metric system (26 42 gals.) M-184
Hek'tometer, a unit in metric system (328 ft. 1 in.) M-184
Hel (*hāl*), or **Hela** (*hāl'ă*), in Scandinavian mythology, goddess of death who ruled over the realm of the dead; daughter of Loki.
Hele (*hā'lĕ*), **Peter**, also known as **Peter Henlein** (1480–1542), clock maker of Nuremberg, Germany, credited with invention of first watch about 1500.
Helen, of Troy, in Homer's 'Iliad', most beautiful woman in Greece, daughter of Zeus and wife of Menelaus, king of Sparta; cause of Trojan War: T-190, 192, T-104, *picture* H-328
Helena (*hĕl'ĕ-ną*), in Shakespeare's 'Midsummer Night's Dream', young Athenian lady, in love with Demetrius M-240
Helena, Saint (247?–327?), mother of Constantine the Great; legendary discoverer of the Holy Cross; festival August 18
tomb E-442, *picture* E-445
Helena, Ark., shipping point on Mississippi River, 70 mi. below Memphis, Tenn.; pop. 11,236; lumber, cottonseed oil; scene of Federal victory in Civil War July 4, 1863: *map* A-367
Helena, Mont., state capital, in s.w. 48 mi. n.e. of Butte; pop. 17,581: H-330–1, M-378, *maps* M-374, U-252
Capitol, State, *picture* M-377
early settlement M-367
Helenium (*hĕ-lē'nĭ-ŭm*), or **sneezeweed**, a genus of plants of the composite family, native to N. and S. America. Rough, erect plants; leaves dotted with tiny glands; flowers daisylike, yellow or brown ray florets notched at outer margins. Plants have been used locally in medicinal preparations.
Helgoland (*hĕl'gō-länt*), or **Heligoland**, German island in North Sea; area, about 150 acres: H-331, *maps* N-301, E-424
returned to West Germany, *picture* W-299*b*
Hel'lades, in Greek mythology, daughters of Helios P-187
Helianthemum (*hē-lĭ-ăn'thē-mŭm*), or **sun rose**, a genus of plants, chiefly shrubs of the rock-rose family, native to Mediterranean and N. America. Branching, with evergreen or half-evergreen foliage; flowers in clusters, white, yellow, or pink; used in rock gardens.
Helian'thus, sunflower genus S-457
Helichrysum (*hĕl-i-krī'sŭm*), a genus of annual and perennial plants of the composite family, native to Africa and Australia. One species (*H. bracteatum*) is grown as an everlasting; plants about 2 feet high; flower heads daisylike, white through purple, dry and stiff, hence called "strawflowers."
Helicon (*hĕl'ĭ-kŏn*), ancient name of a peak or mountain range in Boeotia, Greece; on the e. slope were a grove and temple sacred to the Muses: P-111

Helicopter (*hĕl ĭ kŏp tĕr*) flying machine supported solely by the thrust from a revolving screw or propeller mounted on a vertical axis A 541–2
army use in A 380 *picture* A 382
polar exploration use in *picture* I 350*b*
police department use in *picture* P 355*b*
Heligoland German island *See in Index* Helgoland
Heliocentric theory theory that earth and other planets revolve around sun believed in ancient times by Aristarchus established by work of Copernicus Kepler Galileo and James Bradley
Heliodor yellow beryl used as gem
Heliogabalus (*hē lĭ ō găb ă lŭs*) or **Elagabalus** (AD 205–222) dissolute Roman emperor proclaimed AD 218 introduced into Rome worship of Syrian sun god whose namesake and high priest he was assassinated
Heliograph a sunlight reflector used in signaling T 36
Heliophilia *See in Index* Cape stock
Heliopolis ancient city at head of Nile delta Egypt once seat of sun worship also ancient name of Baalbek Lebanon *map* B 138
Helopsis (*hē lĭ ŏp sĭs*) a genus of sunflowerlike perennials of the composite family native to North America Has become a weed in some places Leaves stems usually rough flowers showy yellow Rough oxeye is *H scabra* hardy sunflower false sunflower or oxeye is *H helianthoides*
Helios in Greek mythology sun god P 187
Circe daughter of C 309
Colossus of Rhodes S 105 *picture* S 105
Odysseus and O 344
Heliotherapy *See in Index* Light therapy
Heliotrope *See in Index* Bloodstone
Heliotrope a flowering plant H 331
Heliotrope garden *See in Index* Valerian
Heliotrope winter *See in Index* Winter heliotrope
Heliotropism the tendency to turn toward or away from light
compass plant C 429
heliotrope H 331
plants B 296
Heliozoan any protozoan of the order Heliozoa often called sun animalcule a single pseudopod may engulf food or several may work together *picture* L 224*b*
Helipterum (*hĕ lĭp tĕr mŭ*) a genus of plants of the composite family native to Australia and S Africa with the genus *Helichrysum* this makes the largest group of everlasting flowers includes the acroclinium and rhodanthe or Swan River everlasting
Helium a gaseous element H 331
tables P 151 C 214
Amarillo Tex H 331 *picture* T 94
atomic structure A 460
balloons use B 281 9 32 3 H 331
chemical inertness C 213 *diagram* I 205
discovered by spectroscope S 332
electric signs employ L 314
electronic structure *diagrams* A 458, C 213
government control M 271
isotopes *picture* R 54*a*
liquefied H 331
mass unit value P 54*c*
radioactivity evolves R 54*b, c, d picture* R 54*a*
Hell
Dante's D 15
Greek Hades H 241 *See also in Index* Hades
Milton's Paradise Lost M 259
Hellas originally a small district in Thessaly ruled by Peleus father of Achilles later applied vaguely to all ancient Greece
Hellbender a salamander S 26
Hell diver the pied billed grebe or dabchick G 187 *pictures* B 173 *color picture* B 179
Helle (*hĕl ē*) princess in Greek legend D 18
Hellebore black *See in Index* Christmas rose
Hellebore white *See in Index* White hellebore
Hellen mythical founder of the Greeks son of Deucalion and Pyrrha father of Dorus (from whom came Dorians) and grandfather of Ion (Ionians) and Achaeus (Achaeans) myth probably arose about 8th century BC when feeling of national unity developed among Greeks
Hellenes (*hĕl ēnz*) ancient Greeks G 196
Hellenistic age G 201 202
at Alexandria A 150
literature G 212
Heller (*hĕl ĕr*) **Stephen** (1814–88) Hungarian composer and pianist born Budapest his teaching studies widely used
Heller a former minor coin of Germany and Austria 1/100 crown also used in Czechoslovakia
Hellespont ancient name for **Dardanelles** D 18 *maps* G 197 A 27
See also in Index Dardanelles
Hero and Leander H 349
Xerxes bridge of ships P 159
Hell Gate rocky narrow part of East River New York City N 218
bridge *picture* B 308 *See also in Index* Bridge *tables*
Hellman Lillian (born 1905) playwright born New Orleans La writer since 1925 characters in Children's Hour Little Foxes and Another Part of the Forest selfish and cruel Watch on the Rhine concerned with an antifascist German Searching Wind deals with events leading to World War II
Hellriegel Hermann (1831–95) German chemist demonstrated ability of leguminous plants to assimilate free nitrogen of the air
Hell's Canyon *See in Index* Grand Canyon of the Snake River
Helm *See in Index* Nautical terms *table*
Helmer Nora heroine of Ibsen's A Doll's House
Helmet
ancient Greek armor A 376
Babylonian *picture* B 85
knights wear *picture* F 60
Marine Corps U S *picture* A 377
World Wars I and II *see pictures* in articles on World War I and World War II
Helmeted basilisk or **helmeted basilisk** a lizard L 284 I 25
Helmet shell S 139*b*
Helmholtz Hermann von (1821–94) German physicist physiologist and mathematician invented ophthalmoscope eminent in nearly every branch of science
sun's heat explained by S 452
Helmont Jan Baptista van (1577–1644) Belgian chemist and physician supposedly first to use term gas distinguished several kinds of gases believed water the basic substance (*Ortus Medicinae*)
Helms Athletic Trophies awarded annually to outstanding athletes and teams Given by Helms Athletic Foundation of Los Angeles established 1936 by Paul H Helms American sportsman
Heloderm a poisonous lizard L 283, *picture* L 283
Héloïse (*ā lō ēz*) (1101?–64) talented French abbess celebrated for her devotion to Abelard A 3
Helotism in botany enslavement of one plant by another L 220
Helots Spartan serfs S 329
Helpmann Robert (born 1909) English dancer and choreographer born Adelaide Australia debut as solo dancer 1923 in Adelaide joined Sadler's Wells Ballet 1933 choreographer and dancer in motion picture The Red Shoes created ballets Comus Hamlet The Birds
Helsingborg Sweden *See in Index* Halsingborg
Helsingfors Finland *See in Index* Helsinki
Helsingor (*hĕl sĭng ĕr*) also **Elsinore** Denmark seaport on NE coast of island Zealand pop 21 010 shipbuilding and commerce scene of Shakespeare's Hamlet *maps* D 71 E 424
Kronborg Castle *picture* D 68
Helsinki (*hĕl sĭng kĭ*) Swedish **Helsingfors** Finland capital and largest city on Gulf of Finland pop 361 834 protected by fortress of Sveaborg paper tobacco carpets machinery publishing *maps* N 301 F 417 424 *picture* F 71
higher education F 71
Helsinki University of at Helsinki Finland F 71 *picture* F 71
Helvetic (*hĕl vĕt ĭk*) **Republic** Swiss republic formed by French 1798 lasted until restoration of Swiss independence by Congress of Vienna 1814
Helvetii (*hĕl vē shĭ ī*) Celtic tribe whose native home was the present SW Germany later they inhabited what is now Switzerland Caesar defeated them 58 BC
Helvetius Claude Adrien (1715–71) French encyclopedist and utilitarian philosopher his most famous book De l'esprit (Of the Spirit) raised a storm was condemned by the Sorbonne and publicly burned
Hem in sewing S 113
Hemans (*hĕm ănz*) **Felicia Dorothea** (1793–1835) English poet born Liverpool sentimental lyrics include The Landing of the Pilgrim Fathers Casabianca England's Dead and The Graves of a Household
Hematin in blood B 208
Hematite most important iron ore (ferric oxide Fe_2O_3) I 237 *table* M 176
gem J 349
United States deposits Alabama B 196 7 Minnesota M 278
Hematoxylin the coloring matter of logwood L 296
Hemerocallis *See in Index* Day lily
Hemingway Ernest (born 1898) American author H 331–2 A 230 *picture* H 332
Hemiptera name of insect order sometimes used to include all insects having sucking mouth parts piercing beaks and incomplete metamorphosis these insects now usually classed in three orders *Hemiptera* the water bugs chinch bugs bedbugs etc *Homoptera* the cicadas aphids scale insects etc and *Anoplura* or *Siphunculata* the true lice *See also in Index* Pages
Hemisphere of brain L 280 *picture* B 281
Hemisphere of earth half of the globe the earth being considered as divided at the equator into Northern

and Southern hemispheres or at some point between Europe and America (usually the 20th meridian) into Eastern and Western hemispheres: W-201, *diagram* E-176
Northern Hemisphere, *map* A-531
Hem'lock, an evergreen cone-bearing tree with needles that are flat and blunt H-332, *picture* H-332, *table* W-186*b*
bark used in tanning L-148
hedges H-329
Hemlock, poison, a plant of the parsley family, with spotted stem and small white flowers P-338, H-332, S-225
Hemlock, water. *See in Index* Water hemlock
Hemlock spruce. *See in Index* Western hemlock
Hemoglobin (*hĕm-ō-glō'bĭn*), the coloring matter of red corpuscles of blood B-208, B-146
action imitated with chelates R-118
Hémon (*ā-môn'*), **Louis** (1880–1913), French author, born Brest; went to Canada; worked on French-Canadian farm where 'Maria Chapdelaine', story of pioneer life, a masterpiece of French-Canadian literature, was written: C-106*a*
Hemophilia (*hē-mō-fil'ĭ-ə*), a blood disease B-210
Hemorrhage (*hĕm'ō-rāj*), violent bleeding
how to stop F-95–6, *pictures* F-94–5
vitamin K controls V-496
Hemp H-332–3, *pictures* H-333, *table* F-63
cables wrapped in C-6
hashish N-13
Manila hemp P-199, H-332, *pictures* R-228, H-333
rope and twine R-227–9, *pictures* R-228–9
sisal H-333, S-190, *pictures* R-228
Hem'pel, Frieda (born 1885), German operatic and concert coloratura soprano, born Leipzig, Germany; debut 1905 at Berlin; with Metropolitan Opera Company, New York City, 1912–19, later a concert singer; noted roles are Gilda in 'Rigoletto', Mimi in 'La Bohème', and Marguerite in 'Faust'.
Hempstead, N.Y., residential suburb of New York City on Long Island; pop. 29,135; *map, inset* N-204
Hen, domestic fowl P-402–3, *picture* P-402–402*b*. *See also in Index* Poultry
Hen, sage, a large grouse G-221
Hen-and-chickens. *See in Index* Live-forever
Hench, Philip S(howalter) (born 1896), physician, born Pittsburgh, Pa.; senior consultant on rheumatic diseases Mayo Clinic, Rochester, Minn., after 1926; also on faculty Mayo Foundation for Medical Education and Research after 1928, professor 1947–; for application of cortisone to rheumatic and other diseases won 1950 Nobel prize in medicine (with Drs. E.C. Kendall and T. Reichstein).
Henderson, Arthur (1863–1935), British Labor leader; advocate of labor internationalism; foreign secretary 1929–31; received Nobel peace prize for 1934.
Henderson, Keith (born 1883), Scottish painter and illustrator; author and illustrator of 'Letters to Helen', 'Prehistoric Man', 'Burns by Himself'
illustration, *picture* E-379
Henderson, Leon (born 1895), economist, born Millville, N.J.; with Russell Sage Foundation 1925–34; consulting economist WPA 1936–38; member Securities and Exchange Commission 1939–41; administrator OPA 1941–42; became chairman board of editors Research Institute of America 1943.
Henderson, Richard (1734–85), pioneer, born Hanover County, Va.; head of Transylvania Land Company which by treaty with Cherokee Indians acquired half of state of Kentucky; organized government there with himself as president, but treaty was annulled by Virginia: B-251
Henderson, Ky., port on Ohio River 10 mi. below Evansville, Ind., in agricultural and coal region; pop. 16,837; tobacco market; textiles, brick and tile, boxes: *map* K-30
Henderson, Nev., town 13 mi. s.e. of Las Vegas; pop. 3643; magnesium refining plant built here during World War II was converted (1951) to production of titanium; chemicals, manganese: *map* N-133, *picture* N-126
Henderson, N.C., city 40 mi. n.e. of Raleigh; pop. 10,996; textiles, hosiery, trucks: *map* N-275
Henderson State Teachers College, at Arkadelphia, Ark.; state control; founded 1929; arts and sciences, education.
Hendrick, Burton Jesse (1870–1949), writer, born New Haven, Conn ('Life and Letters of Walter H. Page', Pulitzer prize for biography 1923; 'The Training of an American', Pulitzer prize for biography 1929; 'Bulwark of the Republic'; 'Statesmen of the Lost Cause'; 'Lincoln's War Cabinet'; 'The Victory at Sea', coauthor Adm. William S. Sims, Pulitzer prize for history 1921).
Hendricks, Thomas Andrews (1819–85), Indiana congressman, senator, and governor; born near Zanesville, Ohio
vice-president of U.S. *See in Index* Vice-president, *table*
Hendricksen, Cornelis, Dutch explorer D-48
Hendrix College, at Conway, Ark.; founded 1884 by Methodist Episcopal church; arts and sciences.
Henequen (*hĕn'ĕ-kĕn*), a species of agave plant S-190, *pictures* R-228, *table* F-63
Yucatán Y-344–5
Hen'gist and Hor'sa, chieftains of first Saxon settlers (A.D. 449?) in England; regarded by some authorities as legendary characters.
Henham, Ernest George. *See in Index* Trevena, John
Hen hawks, or chicken hawks H-291, 292
Henlein (*hĕn'līn*), **Konrad** (1898–1945), Austrian-born leader of Sudeten German party in Czechoslovakia; worked for autonomy, and transference to Germany of Sudeten region; committed suicide after surrender to United States 3d Army.
Henlein, Peter. *See in Index* Hele, Peter
Henley, William Ernest (1849–1903), British poet, author of 'Invictus', ending with the unforgettable lines: "I am the master of my fate: I am the captain of my soul."
Henley-on-Thames, England, town 36 mi. w. of London, famous for its beautiful situation and its annual regattas; pop. 7970.
Henlo'pen, Cape, e. coast of Delaware D-48, *maps* D-48, 53
Henna, a small shrub (*Lawsonia inermis*) of the loosestrife family, cultivated in India, Arabia, and Egypt; leaves yield an orange dye used in coloring hair and leather, and as a cosmetic among many Orientals; the sweet-scented flowers are used in perfumery and embalming; also called Egyptian privet, Jamaica mignonette, and reseda.
Hennepin (*ĕn-păn'*), **Louis** (1640?–1706?), French missionary and explorer H-334
Hennepin Canal (*hĕn'ĕ-pĭn*), or *Illinois and Mississippi Canal*, in Illinois; connects Illinois and Mississippi rivers, by way of Rock River; extends from Great Bend to Rock Island; completed 1908.
Henner (*ĕ-nĕr'*), **Jean Jacques** (1829–1905), French portrait and figure painter, influenced by Correggio; best known for luminous nudes in darkish landscape settings.
"He nothing common did, or mean" C-191
Hen pigeon, or Maltese pigeon, *picture* P-254
Henri, kings of France. *See in Index* Henry I, king of France; Henry II, etc.
Henri (*hĕn'rĭ*), **Robert** (1865–1929), painter of portraits, figures, and landscapes, born Cincinnati; highly individual and vital.
Henrietta cloth, a lightweight wool dress fabric similar to cashmere, but more lustrous in finish; originally made with silk warp; named in honor of Henrietta Maria.
Henrietta Maria (1609–66), French princess, queen of Charles I of England; state of Maryland was named for her: C-190
Henríquez (*ĕn-rē'kĕs*), **Doña Salomé Ureña** (1850–97), poet and educator of Dominican Republic L-127
Henry I (876–936), called "the Fowler," king of Germany and Holy Roman emperor H-334
Henry II (972?–1024), called "the Saint," king of Germany and Holy Roman emperor; commemorated as saint July 15: H-334
Henry III (1017–56), Holy Roman emperor H-334
deposes Gregory VI G-214
Leo IX and L-170
Henry IV (1050–1106), Holy Roman emperor H-334–5, *picture* H-334
investiture conflict G-214–15
Henry V (1081–1125), Holy Roman emperor H-335
Henry VI (1165–97), Holy Roman emperor H-335
Henry VII (1262–1313), Holy Roman emperor H-335
Henry I (1068–1135), king of England H-335, E-361
son of William the Conqueror W-137–8
town charters granted D-64
Henry II (1133–89), king of England H-335–6, *picture* H-335
Becket, Thomas B-92
burial place N-243
conspiracy of his sons J-358, H-336
contest for crown S-390
Ireland I-230*a*
law reforms H-335, E-361: jury system extended J-367
Henry III (1207–72), king of England H-336
Simon de Montfort and the Barons' Wars M-379
Henry IV (1367–1413), king of England H-336, E-363, *picture* H-336
drama by Shakespeare, chronology and rank S-129
Lancastrian line founded L-91
overthrows Richard II R-151
revolt of Wales W-3
Henry V (1387–1422), king of England H-336, E-363
drama by Shakespeare, chronology and rank S-129
Hundred Years' War H-446, A-56
longbowmen, *picture* H-337
Henry VI (1421–71), king of England H-336–7, E-363

dramatized by Shakespeare chronology and legend S 129
founds Oxford College W 158
Hundred Years War H 446
killed on order of Edward IV E 266
Wars of the Roses R 232
Henry VII (1457–1509) king of England *H 337* E 364 T 203
aids John Cabot C 9
chapel in Westminster Abbey W 99
Ireland I 230*a*
Sir Thomas More M 391
Star Chamber S 382
Wales progressed under W 3
Henry VIII (1491–1547) king of England H 337–8 T 364 *picture* H 338
Anne Boleyn B 221
becket shrine destroyed B 92
doll replica *color picture* D 122*f*
drama by Shakespeare chronology and rank S 129
Great Bible I 139*a* *picture* B 138
Holbein H 407 portrait of Anne of Cleves P 271 *color picture* P 271
king of Ireland I 230*a*
Sir Thomas More M 391
Wolsey W 181 2
Henry I (1011–60) king of France H 338
Henry II (1519–59) king of France H 338
Henry III (1551–89) king of France H 338 9
Henry IV (1553–1610) king of France called Henry of Navarre *H 339 picture* H 339
American exploration A 190–1
Maine M 56
Edict of Nantes (1598) H 442–3 H 339
Paris I 84
starts Bourbon rule B 265
Henry of Blois (*bloi*) (1101–71) bishop of Winchester and papal legate brother of King Stephen quarreled *with latter upon refusal of primacy* and for a time supported Matilda's claims to throne
Henry of Navarre *See in Index* Henry IV king of France
Henry the Lion (1129–95) duke of Saxony and Bavaria son of Henry the Proud son in law of Henry II of England by *series of wars* extended power of his duchies in face of opposition of Hohenstaufen emperors G 222*d*
Henry the Navigator (1394–1460) prince of Portugal H 340 1
Columbus influenced by C 417
Portuguese empire extended P 380
tomb P 379 80
Henry the Proud (1108?–39) duke of Saxony and Bavaria defeated fighting to hold *his duchies against* Conrad III whose enmity he had earned by participating in a war against the Hohenstaufens
Henry Alexander (1739–1824) Canadian fur trader author of *Travels and Adventures*
Henry Andrew (1775?–1833) trapper born York County Pa one of founders of Missouri Fur Company (1809) undaunted by Blackfeet attacks explored and trapped on upper Missouri and built Ft Henry near mouth of Snake River joined *Ashley* in Rocky Mountain Fur *Company* (1822) directed trapping near mouth of Yellowstone and in Green Valley (1822–24) won frontier renown for heroism
Henry John *mythical* Negro hero of prodigious strength worked himself to death trying to beat a machine usually a rock drill or according to another version a cotton *rolling machine* legend has been traced to drilling of Big Bend tunnel in Summers County W Va 1870–72 F 199 *picture* F 208
Henry Joseph (1797–1878) physicist born Albany N Y developed methods for weather forecasting discoveries electromagnetic induction E 304 308 oscillatory nature of Leyden jar discharges R 42
Hall of Fame *table* H 249
Henry Marguerite (born 1902) author born Milwaukee Wis at age of 11 began professional career as writer for periodicals and trade *magazines known chiefly for books* for children (Benjamin West and His Cat Grimalkin Misty of Chincoteague King of the Wind awarded Newbery medal 1948 *A Pocketful of Horses*
Henry O (pen name of William Sydney Porter (1862–1910) American short story writer P 375–6
Henry Patrick (1736–99) American Revolutionary War orator and leader H 339 40 *pictures* H 340 P 125
George Rogers Clark and C 339
Hall of Fame *table* H 249
Jefferson quoted on J 332*a*
St Johns Church *picture* V 491
Henry Cape a point of land in southeastern Virginia 15 miles south of Norfolk at *entrance to Chesapeake Bay map* V 487
Colonial National Historical Park V 32 *map* N 18
Henry the unit of electric inductance *T 306*
Henry E Huntington Library and Art Gallery San Marino Calif given to the public by Henry E Huntington in 1927 contains a fine collection of English 18th century early Italian and Flemish paintings and other objects of art also rare books and manuscripts in fields of history and literature L 197 *picture* U 331
The Blue Boy *See in Index* Blue Boy The
Henry Esmond novel by Thackeray T 108 109
Henryetta *Okla city 55 miles of* Tulsa in rich coal mining district abundance of fuel gas zinc smelters large glass factory pop 7987 *map* O 371
Henry Fitz Henry (1156–83) second son of Henry II and subsequently heir to English throne intrigued against father and died warring against brother Richard celebrated for knightly exploits
Henry Francis du Pont Winterthur Museum in Winterthur Del about 5 mi NW of Wilmington noted for its collections of colonial American decorative arts
room interiors *pictures* A 202–3
Henry Hudson Bridge New York City *See in Index* Bridge *table*
Henry Hudson Parkway New York City N 222
Henry Street Settlement social settlement in New York City founded 1893 by Lillian D Wald
Henschel Sir George *(1850–1934)* English musical director composer and singer born Breslau Germany first conductor of Boston Symphony Orchestra 1881–84 founder and conductor of *London Symphony Orchestra* 1884–85 (Stabat Mater an oratorio Nubia opera A Sea Change comic opera)
Henschke Alfred *See in Index* Klaxon
Henslowe Philip (died 1616) English theatrical manager in whose theaters plays by famous Elizabethan dramatists were produced S 119 20
Henson Josiah (1787–1883) American Negro clergyman his life furnished basis for Uncle Tom's Cabin *S 424*
Henson Matthew Alexander (1866–1955) Negro who accompanied Rear Admiral Peary to North Pole born Charles County Md P 108 *picture P 350*
Henty George Alfred (1832–1902) English author soldier and war correspondent writer of boys' adventure stories of his 80 odd books some of the best are In Freedom's Cause Under Drake's Flag In Times of Peril The Lion of the North
Hepatica or **liverleaf** a plant of the crowfoot family with liver shaped leaves H 341 *color picture* F 170
Hepaticae (*hē pĭt' ĭ sē*) a class of primitive plants including liverworts *Reference Outline* B 265
Hepat artery I 277
Hepburn (*hĕb'ŭrn*) **Audrey** (born 1929) actress born Brussels Belgium of Dutch mother and English Irish father educated in England and the Netherlands to U S 1951 starred in Broadway plays Gigi and Ondine and in American motion pictures Roman Holiday (for which she won 1953 Academy award) and Sabrina
Hepburn James See in *Index* Bothwell
Hepburn (*hĕp'bĕr*) **William Peters** (1833–1916) political leader born Wellsville Ohio served 11 terms as Republican congressman from Iowa author of Hepburn law
Hepburn law P 223
Hephaestus (*hē fĕs'tŭs*) in Greek mythology god of fire H 341
Aphrodite wife of A 273
armor of Achilles A 9
temple A 449
Hepplewhite George (died 1786) English furniture maker whose delicate graceful chairs were lighter and smaller than Chippendale's and had typically straight slender legs his pieces were characterized by simplicity and refined elegance furniture I 178 *picture* I 183
Heptameron (Greek seven days) collection of short stories made by various writers at court of Marguerite of Valois (or Navarre) imitative of Boccaccio's Decameron important in history of French literature
Heptane *in chemistry See in Index* Paraffin series
Heptarchy (*hĕp'tär kĭ*) Greek word meaning seven kingdoms applied to seven divisions of England under *Angles* and Saxons—Kent Sussex Wessex Essex Northumberland East Anglia and Mercia Term is misleading as the number of kingdoms varied from time to time
Heptateuch (*hĕp'tă tūk*) the *first* seven books of the Old Testament
Hera (*hē'ra*) in Greek mythology queen of the gods wife of Zeus identified with Roman goddess Juno *H 341 R 132*
hostile to Hercules H 342
jealous of Io I 204*f*
judgment of Paris T 190
Heraclea ancient town in Asia Minor *See in Index* Ereğli
Heraclea battle of (280 B C) Italy P 448
Heracles *See in Index* Hercules
Heraclides or Heracleides Ponticus (*hĕr ă klĭ dēz' pŏn tĭ' kŭs*) Greek philosopher of 4th century B C born Heraclea in Pontus reputedly first to explain that the apparent rotation of the heavens is brought about by rotation of the earth on its axis rather than by the passage of stars around the earth

Heraclitus (*hĕr-a-klī'tŭs*) (540?–475? B.C.), Greek philosopher, called founder of metaphysics; taught that constant change from being to not-being is fundamental principle of universe, and that all things are part of one primary substance, fire; because of his somber view of life he is sometimes called the Weeping Philosopher or Dark Philosopher.
Heraclius (*hĕr-a-klī'ŭs*) (575–641), Byzantine emperor, son of one of Emperor Maurice's generals; killed Emperor Phocas to avenge death of Maurice and became emperor 610; saved empire from Persians, who had conquered Syria during reign of Phocas.
Herakleion, Crete. *See in Index* Erakleion
Herakles. *See in Index* Hercules
Herald, court chronicler of Middle Ages H-341
Heraldry, science of armorial bearings H-341
  early flags follow heraldic rules F-122
Herat (*hĕ-rät'*), fortified city in n.w. Afghanistan in province of same name; of strategic importance; pop. 75,642; caravan center; once capital of Timur Leng's empire: *maps* A-33, A-406
Herbarium F-181
  world's largest B-261
Herbart (*hĕr'bärt*), **Johann Friedrich** (1776–1841), German philosopher, psychologist, and educator; influenced by Fichte and Pestalozzi; occupied chair of philosophy at Königsberg 1809–33; contributed to development of psychology and pedagogics ('Psychology as Knowledge'; 'Psychology'): E-245
Herbert, George (1593–1633), English poet, born Wales; saintly pastor of Bemerton, England, near Salisbury; 'The Temple: Sacred Poems and Private Ejaculations' is full of quaint artificialities but contains some of the most treasured English sacred lyrics ('A Priest to the Temple, or the Country Parson', prose).
Herbert, Victor (1859–1924), Irish-American cellist, conductor, and composer H-342, *picture* H-342
  light operas O-398, H-342
Herbiv'orous animals, those that feed on plants A-250
  stomach R-254–5, S-401
Herb Robert, flowering plant G-82
Herbs, plants without woody stems in which the stems and foliage die to the ground in winter; such plants are often called herbaceous; herbs may be annual, biennial, or perennial. The term herb is especially applied to those herbaceous plants used medicinally, as vegetables, or for flavoring and garnishing: P-289–90
  flavoring herbs S-341: mint M-291–2
Herculaneum (*hĕr-kū-lā'nē-ŭm*), ancient Roman city near Mt. Vesuvius, buried with Pompeii A.D. 79: P-366–8, *map* P-367
  excavations P-367–8
Hercules (*hĕr'kū-lēz*), or **Heracles**, hero in Greek and Roman mythology H-342–3, *picture* H-342
  Hebe, wife of H-326
  Olympic Games founded by O-381
Hercules, constellation, *charts* S-377, 381
Hercules, Pillars of. *See in Index* Pillars of Hercules
Hercules beetle B-108, *picture* B-105
Herder (*hĕr'dĕr*), **Johann Gottfried von** (1744–1803), German critic, philosopher, and poet: 'Kritische Wälder' (Critical Forests); 'Ideen zur Philosophie der Geschichte' (Ideas Concerning the Philosophy of History)
  influence on German literature G-130, G-84
Hérédia (*ā-rā-dē-ä'*), **José de** (1842–1905), French poet, born Cuba; modern master of French sonnet
  influence on Canadian literature C-106
Hérédia, José María (1803–39), Cuban poet, cousin of above L-127, *picture* L-125
Hered'ity, transmission of qualities from parents to offspring H-343–8, B-151, *pictures* H-343, 345–7. *See also in Index* Breeding; Evolution; Plant improvement
  chromatin H-344, 346, B-148, *color picture* B-149
  colchicine influences in plants P-307
  color, *diagrams* H-345
  environment modifies H-347
  eugenics E-413
  feeble-mindedness due to H-348, M-172
  fruit fly used in study H-346, F-189: chromosomes, *picture* H-347
  Galton's techniques B-154
  genes, function H-347–8
  individual differences caused by I-113
  Mendel's laws H-344, B-151, E-452, *diagrams* H-345
  mutation E-452–3, H-348
  relation to sociology S-221
  reversion to type: goldfish G-135; pigeons P-254
  Zola's novels deal with Z-352
Hereford (*hĕr'ē-fērd*), or **Herefordshire**, inland county in s.w. England on Wales border; 842 sq. mi.; pop. 127,092; cap. Hereford: *map* E-347
Hereford, England, county town of Herefordshire, 120 mi. n.w. of London; 11th-century cathedral; pop. 32,490: *map* B-325
Hereford (*hĕr'ē-fērd*, in U.S. chiefly *hûr'fērd*), breed of cattle, commonly red with white markings C-146, *pictures* C-143, A-62, A-142
  brought to U.S. A-63
  Brahman-Hereford crossbreeding C-146, *picture* C-144
  calf, *picture* C-141
"Here lies one whose name was writ in water" K-19
Herero (*hĕ-rā'rō*), a Bantu people of s.w. Africa, *color picture* A-35
Here's a Ball for Baby, game P-319
Her'esy, teaching opposed to established religion or religious authority. *See also in Index* Arianism; Inquisition; Reformation, Protestant
  Abelard A-3
  Albigenses, Philip's crusade P-190
  Huss burned for H-452
  Savonarola burned as heretic S-52
  Waldenses massacred for F-276
  Wycliffe W-314
Hereward (*hĕr'ē-wērd*) (11th century), English patriot outlaw; led Saxon resistance until driven from fens of Isle of Ely by William the Conqueror; hero of Kingsley's 'Hereward the Wake'.
Herford (*hĕr'fērd*), **Oliver** (1863–1935), American humorist, artist, and playwright, born England ('Kitten's Garden of Verses', 'Child's Primer of Natural History'; 'The Florist Shop', play).
Hergesheimer (*hĕr'gĕs-hī-mĕr*), **Joseph** (1880–1954), novelist, born Philadelphia, Pa.; studied to be a painter, but turned to literature ('The Three Black Pennys'; 'Java Head'; 'Cytherea'; 'The Bright Shawl').
Hering (*hā'ring*), **Ewald** (1834–1918), German physiologist and psychologist: advanced theory of four colors occurring in pairs as opposed to three-color theory of Helmholtz.
Her'kimer, Nicholas (1715?–77), American Revolutionary War general; defeated British at Oriskany, N.Y., but was fatally wounded.
Herman, Woodrow Wilson (Woody) (born 1913), composer, clarinetist, saxophone player, and bandleader, born Milwaukee, Wis.
Hermann, or Arminius (17 B.C.–A.D. 21), German chieftain who destroyed a Roman army at the battle of Teutoburg Forest.
Hermannstadt, Rumania. *See in Index* Sibiu
Hermaphrodi'tism, existence in single plant or animal of both male and female reproductive organs.
Hermas, a Christian writer said to have lived in 2d century; sometimes identified with the Hermas in Rom. xvi. 14, author of mystical allegory 'The Shepherd of Hermas'.
Hermes (*hĕr'mēz*), in Greek mythology messenger of gods; Roman Mercury: H-348, *picture* H-241
  Odin identified with Mercury O-340
  Perseus and P-154
  Praxiteles' statue of 'Hermes with the Infant Dionysus' G-204–5, S-77, *picture* S-77
  protects Odysseus C-309
  slays Argus I-204*d*
Hermes Trismegis'tus ("Hermes the thrice greatest"), Greek name of Egyptian god Thoth; reputed author of Hermetic Books, encyclopedic works on Egyptian religion, art, and science.
Her'mia, in Shakespeare's 'Midsummer Night's Dream', daughter of Egeus, in love with Lysander M-240
Hermione (*hĕr-mī'ō-nē*), in Shakespeare's 'Winter's Tale', wife of Leontes W-160
Hermit, Christian M-354
Hermitage, art gallery in Leningrad L-163
Hermitage, The, home of Andrew Jackson J-288
Hermit crab, a type that lives in an empty mollusk shell C-504, 505, *picture* C-504
Hermit Kingdom (Korea) K-64*a*
Hermit thrush T-126–7
  state bird, *table* B-158
Hermon, Mount, mountain in Syria 30 mi. s.w. of Damascus; 9400 ft.; Arabic Jebel-es-Sheikh: *map* B-138
Hermopolis Parva, Lower Egypt. *See in Index* Damanhur
Hermosa Beach, Calif., city 15 mi. s.w. of Los Angeles, on Pacific; pop. 11,826; residential; hand printed materials; ocean aquarium: *map, inset* C-35
Hermoup'olis, or Hermopolis, Greek city on e. coast of island of Syra; capital of Cyclades; shipbuilding and commercial center; exports tobacco; pop. 21,000: *map* G-189
Hernández (*ĕr-nän'dĕz*), **José** (1834–86), Argentine poet L-124, 125
'Hernani' (*ĕr-nä-nē'*), tragedy by Victor Hugo; Count Hernani, to fulfill a pledge, ends life just as love, wealth, and high dignities are his; Verdi's opera 'Ernani' founded on tragedy: H-441
Herndon, Hugh, Jr. (1905–52), American aviator, *table* A-104
Herndon, William H. (1818–91), lawyer, born in Greensburg, Ky.; mayor of Springfield, Ill.; law partner of Lincoln and author in collaboration with J. W. Weik of 'Herndon's Lincoln' and 'The True Story of a Great Life': L-247
Herne, James A. (originally James Aherne) (1840–1901), actor and dramatist, born Cohoes, N.Y.; skillful in depiction of rural life and everyday types of character ('Shore

Acres Margaret Fleming) A 231
Hero or **Heron of Alexandria** (first century AD) Greek mathematician and writer
steam engine S 390 *picture* J 341
Hero and Leander lovers in famous Greek legend H 349
Herod I the Great king of Judea (37–34 BC) H 349
orders children slain D 133 J 339
Tower of David *picture* J 336
Herod Agrippa I (10? BC AD 44) king of Judea acquired territory equal in extent to that of his grandfather Herod the Great favored Jews and persecuted Christians
Herod Agrippa II (AD 27–100) son of above last king of family of Herod the Great St Paul was tried before him at Caesarea
Herod Antipas tetrarch of Galilee (4 BC AD 39) H 349
Herodias (*hē rō di as*) wife of Herod Antipas mother of Salome and instigator of the beheading of John the Baptist H 349
Herodotus (*hē rŏd ō t s*) (484? 4?? BC) Greek historian father of history H 349
History cited F 210 S 188 T 117 *I 246* concerning alphabet A 179
place in Greek literature G 211
quoted P 385
Heroic couplet a verse form P 336
used by Dryden D 157 Pope P 369 *P 336*
Heroin (*hĕr ō in*) a narcotic drug *N 13*
poisoning first aid for P 341
Heroism *See in Index* Courage
Heron a wading bird H 349–51 *pictures H 349–50*
cattle heron or buffalo bird B 341 *compared with cranes C 507*
egret H 349 50 351 *pictures* H 350
Audubon painting *picture* A 471
food of young P 174
great blue H 350 *picture* H 349 *color picture* B 180
length of life average pictograph A 249
nest H 350 *picture* B 173
Heron of Alexandria. *See in Index* Hero
Heronry nesting and breeding place of herons *H 350*
Hero of the Soviet Union Russian decoration of honor D 40
Herophilus (*hē rŏf i lus*) (flourished 300 BC) Greek surgeon born Chalcedon in Bithynia helped found school of anatomy Alexandria among first to carry on post mortem examinations made important studies of nervous system M 164*b*
Herostratus (*hē rŏs tra t s*) (4th century BC) Ephesian who set fire to temple of Artemis S 105
Héroult (*a ro*) **Paul Louis Toussaint** (186?–1914) French metallurgist discoverer of method of separating aluminum A 184 H 249
Herpetology (*hûr pē tŏl o jĭ*) the science dealing *with the study of* reptiles *See also Index* Reptiles
Herr German title of polite address to a man
Herrera (*ĕr ra ra*) **Alphonso** (born 1868) Mexican biologist director biology division Mexican department of agriculture held *all matter* capable of life under proper conditions *was able to imitate* living cells with inanimate substances in laboratory
Herrera Fernando de (1534–97) Spanish lyric and epic poet foreign influence shown in his work did much to enrich the language
Herrera Francisco de (1576–1656) called el Viejo (the old) Spanish painter engraver etcher and architect born Seville noted for genre and religious paintings (Last Judgment in church at *Seville St Basil Dictating His* Doctrine in Louvre) His son Francisco called el Mozo (the young) was painter to King Philip IV also noted as architect
Herreshoff (*hĕr ĕs hŏf*) **John Brown** (1841–1915) blind shipbuilder and yacht designer born Bristol RI member of a family of shipbuilders and founder of firm which designed yachts that *defended America's* Cup
Herrick Myron T (1854–1929) capitalist and diplomat born Huntington in Ohio started rural credit movement in US governor of *Ohio 1903 6* ambassador to France 1912–14 1921–29
Herrick Robert (1591 16 4) English lyric poet Coronna's Maying *Night Piece to Julia Cather Ye* Parcels and other delicate exquisite often passioned verse published in book Hesperides D 378
Herrick Robert (1868 1938) novelist born Cambridge Mass professor at University of Chicago 1895–1923 general secretary of Virgin Islands 1935 38 works deal with modern life realist (The Common Lot Together A Life for a Life The Conscript Mother Chimes The End of Desire)
Herrin Ill coal mining center in s of state 10 mi nw of Marion pop 9331 machine shops foundries powder plant *map I 37*
Herring a soft finned food fish H 351 F 114 *picture* H 351
eggs number laid O 332
fisheries Hanseatic League monopoly H 261 Iceland I 10*a pictures* I 10
lake or cisco W 121
place in food chain *picture* F 100
plankton their only food F 100
young sold as sardines S 44
Herring family the *Clupeidae* (*klū pē i dē*) a family of soft finned fishes comprising the herring alewife shad sardine and menhaden
Herring gull *G 231 color picture* B 179
Herriot (*er e ō*) ***Edouard*** (born 1872) French statesman distinguished as scholar man of letters and radical political leader premier and minister of *foreign affairs 1924–25 and again in 1926 and 1932* mayor of Lyons and president of the chamber of deputies in German custody 1942–45 (Life and Times of Beethoven United States of Europe)
Herschel Caroline (1750–1848) English astronomer born Germany sister and assistant of Sir William Herschel discovered five comets
Herschel Sir John F W (1792 1871) *English astronomer son of* Sir William Herschel discovered 525 star clusters and nebulae not recorded by his father made first telescopic survey of southern heavens invented a process of photography *on sensitized paper* first to use terms positive and negative in photography
blueprint process B 212
Herschel Sir William (1738–1822) English astronomer and organist *born Hanover Germany* developed study of fixed stars and discovered 5000 star clusters proved motion of solar system through space discovered planet Uranus 1781
infrared rays I 148
telescopes T 47
Herschel Sir William J (1833–1917) British official son of Sir J F W Herschel and grandson *of Sir William* Herschel inventor of system of fingerprint identification
Herschell Farrar Herschell first Baron (1837–99) lord chancellor of England in 1886 and again 1892–95 *president of Anglo-American* boundary commission 1898–99
Hersey John Richard (born 1914) American writer born Tientsin China war correspondent in World War II (reporting—Hiroshima novels—*A Bell for Adano* 1945 Pulitzer prize winner dramatized on stage and in motion pictures and The Wall story of Jewish resistance in Warsaw 1939–43)
Hershey Lewis Blaine (born 1893) US Army officer born Steuben County Ind War Department general staff 1936–40 director of Selective Service System 1941–46 and after 1948 director of *Selective Service Records 1947–48*
Hershey Milton Snavely (1857–1945) confectioner and philanthropist born Dauphin County Pa built up huge chocolate *industry founded* Hershey Industrial School for orphan *boys at Hershey Pa in 1909* in 1918 transferred fortune estimated at $60 000 000 to school
Hershey Pa *picture* P 123
Herstmonceux Castle England *See also Index* Hurstmonceux Castle
Herter Albert (1871–1950) mural painter born New York City
painting by *picture* U 341
Hertford (*har fĕrd*) or **Hertfordshire** inland county in s e England 632 sq mi pop 603 730 cap Hertford (pop *13 890*) agriculture *map* E 347
Hertford College Oxford England *O 434*
Hertogenbosch *See also Index* s Hertogenbosch
Herty Charles Holmes (1867 *1938*) chemist born Milledgeville Ga professor of chemistry at University of North Carolina 1906 16 editor *Journal of Industrial and Engineering Chemistry* 1917–21 *spent years in research in dye* turpentine and paper industries P 89 P 303–4 P 258 *picture* P 304
Hertz (*herts*) **Alfred** (1872–1942) German American musician born Frankfort at Metropolitan Opera *House New York City 1902 15* directed first performance of Wagner's Parsifal outside of Bayreuth director San Francisco Symphony Orchestra 1915–30 inaugurated concerts in Hollywood Bowl *Los Angeles*
Hertz Gustav (born 1887) German physicist *See also in Index* Franck James
Hertz Heinrich Rudolph (1857–94) German physicist born at Hamburg *became assistant to* Helmholtz at Berlin professor of physics *University of Bonn* principal studies electrical including Hertzian waves later developed into radio E 303 P 235 P 29 *picture* E 303
cathode ray studies X 329
radio (Hertzian) waves discovered R *42–3*
Hertz Henrik (1798–1870) Danish poet and dramatist of Jewish parentage romantic feeling and grace *fulness* (*King René's Daughter*, Svend Dyrings House)
Hertzian waves a term sometimes used for radio waves P 42–3 *See also in Index* Radio *ether* waves
Hertzog James Barry Munnik (1866

1942), South African statesman and general; premier and minister for native affairs 1924–39; leader of old Republican Boers; after 1924 modified his anti-British policy; delegate to British Imperial Conference 1926: S-202

'Herve Riel' (*ĕr-vā' rē-ĕl'*), poem by Robert Browning about a Breton sailor who piloted the French fleet safely into St. Malo after its serious defeat by the English and Dutch off Cape La Hogue in English Channel (1692).

Hervey Archipelago, in s. Pacific. *See in Index* Cook Islands

Hervieu (*ĕr-vē-yū'*), **Paul Ernest** (1857–1915), French playwright and novelist, born Neuilly; first wrote under pseudonym Eliacin; noted for brilliantly constructed plays which exposed social evils and suggested remedies for them.

Herzegovina. *See in Index* Bosnia and Herzegovina

Herzen (*hĕrt'sĕn*), **Alexander** (1812–70), Russian author and publicist; political writings, secretly circulated in Russia, stirred up revolt against Russian absolutism: R-295

Herzig, August Albert Theodor (1846–1919), German sculptor
'Echo', statue, *picture* E-210

Herzl (*hĕrt'sl*), **Theodor** (1860–1904), Hungarian Jew, founder of modern political Zionism P-46
memorial parade, *picture* I-257

Herzog, Maurice (born 1919), French mountain climber and engineer, born Lyon, France; in 1950 led nine-man French expedition which scaled Annapurna in Himalayas; wrote of experiences in 'Annapurna'; on lecture tour in U.S. 1953. *See also in Index* Annapurna

Hesiod (*hē'sī-ŏd*) (8th century B.C.), father of Greek didactic poetry G-209

Hesper, or **Hesperus**, name given by Greeks to evening star; the son of Eos (Aurora) in Greek mythology; at first considered to be same as Phosphor, the morning star; later believed to be his brother.

Hesperia (The Western Land), name given to Italy by Greek poets in ancient times: *map* G-197

Hesperides (*hĕs-pĕr'ĭ-dēz*), in Greek mythology, sisters, supposed to be four in number, symbols of love and fruitfulness; figure in stories of Cadmus, Thetis, and Atalanta
Hercules obtains apples of H-343

Hesperis. *See in Index* Sweet rocket

Hesperus. *See in Index* Hesper

Hess, Alfred (1875–1933), American pediatrician and pathologist; discovered treatment for rickets: V-498

Hess, Myra, Dame (born 1890), English pianist; at age of 12 won scholarship to Royal Academy of Music; debut at Queen's Hall, London, 1907; appeared widely in Europe, and since 1922 also in U.S. and Canada; famed for rendition of Bach, Mozart, and Scarlatti.

Hess, Rudolph (born 1894), deputy leader of German National Socialist party; assisted Hitler in writing 'Mein Kampf'; Fuehrer's deputy in Reichstag after 1933; flew to Scotland May 1941, landed by parachute, surrendered to British; kept prisoner; his peace proposals revealed Sept. 1943; sentenced to life imprisonment for war crimes Sept. 1946: H-385, W-257

Hess, Victor F(ranels) (born 1883), American physicist, born Waldstein, Austria, became U. S. citizen 1944; "for his discovery of cosmic radiation," he shared 1936 Nobel prize in physics with Carl D. Anderson; since 1938, professor of physics, Fordham University, New York City: R-32

Hess, Walter Rudolf (born 1881), Swiss physiologist; director physiological institute, University of Zurich; for discovery (through experiments on cats and dogs) of how certain areas of the brain govern organs of the body, shared 1949 Nobel prize in medicine and physiology with Egas Moniz.

Hesse (*hĕs'ĕ*), **Hermann** (born 1877), Swiss novelist and poet, born Germany (Swiss citizen after 1923); Nobel prize in literature 1946 (novels: 'Peter Camenzind', 'Death and the Lover', Magister Ludi')

Hesse (*hĕs* or *hĕs'ĕ*), German Hessen, state and former duchy in s.w Germany; 2970 sq. mi ; pop. 1,347,000 agriculture, lumber, wine; coal and iron; leather, cloth chemicals; after World War II, state enlarged by addition of part of Hesse-Nassau (area of new state 8153 sq. mi.; pop. 4,323,801): *map* G-88

Hesse-Cassel (*kăs'ĕl*), former German electorate; joined Austria in Austro-Prussian War (1866); annexed by Prussia.

Hesse-Nassau (*nă'sou*) former province of Prussia, Germany after World War II, incorporated into Hesse.

Hes'sian fly, a gall midge *II-351, color picture* I-154*d*
control methods A-63
fossil ancestor, *picture* A-186

Hessians, German soldiers hired by England during American Revolution to fight against colonists; about half were from Hesse-Cassel and Hesse-Darmstadt, hence name
battle of Trenton R-128*a*

Hes'tia, Greek goddess of hearth and home; Roman Vesta: V-464–5
daughter of Kronos and Rhea R-132

Hetch Hetchy Valley, California, a deep valley of the Sierra Nevada, in Yosemite National Park Y-341*b*
reservoir and aqueduct for San Francisco A-283, S-42

Heteroauxin, aids plant growth P-306

Heterodyning, in radio R-38

Het'eropappus, a genus of asterlike plants of the composite family; perennial, low-growing, with azure-blue flowers; native to Japan and China; also called blue daisy.

Heuchera. *See in Index* Alumroot

Heuss (*hois*), **Theodor** (born 1884), German educator, author, and political leader, born Brackenheim, Württemberg; book, 'Hitler's Way', condemned by Nazis; after World War II, became chairman of Free Democratic party; elected first president of Federal Republic of Germany September 1949.

He'vea brasilien'sis, a rubber tree R-237–8

Hevesy (*hĕ'vĕ-shĭ*), **Georg von** (born 1885), Hungarian chemist; with D. Coster discovered hafnium (1923); won 1943 Nobel prize in chemistry for use of isotopes in tracing chemical processes.

"He was not of an age, but for all time" S-120

Hewes, Agnes Danforth (born 1873?), American author, born Syria; children's books are historical in setting ('A Boy of the Lost Crusade'; 'Spice and the Devil's Cave'; 'Glory of the Seas'; 'Codfish Musket', 'Spice Ho!'; 'A Hundred Bridges to Go').

Hewes, Joseph (1730–79), signer of Declaration of Independence; born Kingston, N.J.; delegate from North Carolina to Continental Congress
signature reproduced D-37

Hewins, Caroline Maria (1846–1926), librarian, born Roxbury, Mass.; from 1875 librarian, Hartford, Conn., Public Library; one of earliest leaders in development of children's libraries.

Hewitt, Abram S. (1822–1903), American capitalist and political leader; consistent advocate of good government; introduced into America open-hearth process of making steel; representative in Congress 1875–79, 1881–86; mayor of New York City 1886–90.

Hewitt, Peter Cooper (1861–1921), American inventor; son of Abram S. Hewitt and grandson of Peter Cooper, invented Cooper-Hewitt mercury vapor electric lamp and mercury vapor rectifier

Hew'lett, James Monroe (1868–1941), architect and mural painter, born Lawrence, Long Island, N.Y.; designed Brooklyn Masonic Temple, Philadelphia War Memorial; murals in Carnegie Institute of Technology, Pittsburgh, and Columbia University Club, New York
Brooklyn Bridge, mural, *picture* A-390

Hewlett, Maurice Henry (1861–1923), English romantic novelist ('The Forest Lovers', 'The Queen's Quair'; 'Open Country', time ranging from medieval to modern, scenes from Iceland to Italy)
'The Life and Death of Richard Yea-and-Nay' R-150

Hexag'onal crystals M-262

Hexam'eter, in poetry P-335

Hexane, in chemistry. *See in Index* Paraffin series

Hexan'oda, the class of six-legged arthropods, or insects I-153

Hexateuch (*hĕk'sa-tūk*), name given to the first six books of the Bible—Genesis, Exodus, Leviticus, Numbers, Deuteronomy, and Joshua.

Hex'ham, market town in n. England on Tyne River, 20 mi. w. of Newcastle; here Yorkists defeated Lancastrians in 1464; pop. 9715; gloves and coal: *map* B-324

Hexobarbital ("evipal"), an anesthetic A-246

Heydrich, Reinhard (1904–42), director, German Gestapo; "protector," Bohemia, 1941–42; assassinated in Prague 1942: C-536

Heyerdahl, Thor (born 1914), Norwegian scientist and writer on travel and outdoor life; book 'Kon-Tiki' is story of his balsa-raft expedition from Peru to well within Polynesia (4300 mi.) to prove his theory that Polynesian race is of American origin, not Asiatic; also wrote 'American Indians in the Pacific': E-456–7

Heyl, Paul Renno (born 1872), physicist, born Philadephia, Pa.; with U.S. Bureau of Standards 1920–42; invented, with Dr. L. J. Briggs, earth induction compass
measures earth's mass E-193

Heyse (*hī'zĕ*), **Paul** (1830–1914), German poet, novelist, and short-story writer; Nobel prize winner, 1910; master of novelette ('Children of the World'; 'In Paradise').

Heyward, DuBose (1885–1940), writer and lecturer, born Charleston, S.C.; wrote of Negro life with understanding and realism ('Carolina Chansons', poems; 'Porgy', novel, later dramatized 'Mamba's Daughters', novel).

Heyward, Thomas, Jr. (1746–1809), jurist, born St. Luke's, S.C., a signer of Declaration of Independence; in Continental Congress 1775–78;

taken prisoner by British in Revolution
signature reproduced D 37

Heywood John (1497?–1580?) English writer and entertainer at courts of Henry VIII and Mary I wrote court interludes which introduced personal characters rather than *abstractions linking morality play* with English comedy (The Play Called the Foure PP) also wrote epigrams and proverbs

Heywood Thomas (died 1641?) English dramatist claimed to have written in whole or part more than 200 plays at his best unsurpassed domestic drama (A Woman Killed with Kindness)

Hezekiah (8th century B.C.) king of Judah reigned important for two invasions of Judah by Sennacherib of Assyria (one about 701 B.C. and about 691 B.C.) in first Sennacherib was successful but in second a plague in the Assyrian army saved Judah
H H *See in Index* Jackson Helen Hunt

Hialeah *city 7 mi nw of* Miami pop 19 [illegible] horse racing *map* I 159

Hiawatha (*hī ə wŏ'thə*) Iroquois reformer statesman and prophet flourished about 1570 founder of *the League of Iroquois* and promoter of peace [illegible] 1081
Longfellow's poem I 310 quoted O 431 L 103 W 84

Hibachi Japanese charcoal brazier J 300

Hibben John Grier (1861–1933) educator born Peoria Ill president Princeton University Presbyterian pastor Chambersburg Pa 1887–91 taught logic and psychology at Princeton *1891 1912 president* 1912–30 author of books on logic and philosophy

Hibben Paxton (1880–1928) journalist born Indianapolis Ind diplomatic service in Russia Mexico Colombia Holland (The Famine in Russia) Henry Ward Beecher)

Hibbing Minn village 60 mi nw of Duluth in famous Mesabi iron ore range pop 16 976 *largest open* pit iron ore mine in world lies within village limits M 280 *ps M 286 U 253*
first scheduled intercity motorbus line in America B 364

Hibernation dormancy of animals during the winter H 352–3 *pictures* H 352–3 *See also Index* Estivation
ant A 255
badger H 352
bat H 352 353 B 77
bear B 85–8 88 H 352
butterflies and moths B 367*c–d*
chipmunk C 287
dormouse D 125
earthworm E 197 *picture H 353*
fiddler crab C 504
fish H 352 F 107 eel E 267
frog F 300 H 352 353
ground hog G 219 H 352
insects I 159 chinch bug C 287, bee B 99
lizard L 282
prairie dog P 406
salamander S 25
skunk S *193*
snail and slug S 204
snake S 209 H 353 rattlesnake R 78
spiders S 345 6
toad T 141
turtle and tortoise T 223 H 353

Hibernia (*hī bĕr'nĭ ə*) ancient Latin and poetical name *of Ireland*

Hibernians Ancient Order of a fraternal society of Roman Catholic men of Irish birth or descent history *traced to 17th century or earlier* in Ireland American branch organized in New York City in 1836 aided Irish national movement provides sick benefits insurance and help for members

Hibiscus a large genus of herbs and shrubs of the mallow family many of which are popularly called rose mallow most species have large *showy flowers* among the species cultivated in gardens are the rose *of Sharon* (*Hibiscus syriacus*) swamp rose mallow (*Hibiscus Moscheutos*) and flower of an hour (*Hibiscus Trionum*) fruit of okra or gumbo (*Hibiscus esculentus*) used as *food* fiber plant kenaf (*Hibiscus cannabinus*) used as a substitute for jute

Hiccough or hiccup sharp sound caused by sudden arrest of breathing due to spasmodic contraction of the diaphragm and glottis

Hichens Robert Smythe (1864 1950) English novelist and playwright (Green Carnation The Garden of Allah Bella Donna)

Hickok James B (Wild Bill) (1837 76) frontiersman born Troy Grove Ill stagecoach driver on Santa Fe and Oregon trails Union scout spy and U S deputy marshal during and after Civil War *fond* of gambling and famed as a dead shot town marshal of Hays City Kan 1869 of Abilene Kan 1871 killed many thieves and outlaws murdered at Deadwood S D by Jack McCall

Hickory N C *city 4 mi nw of* Charlotte pop 14 725 hickory wagons made here since 1880 textile mills furniture *map* N 274

Hickory a North American tree of the walnut family H 353–5 *pictures* H 354–5 *table* W 186*c*

Hickory elm a tree *E 335*

Hicks Edward (1780 1849) painter known for Biblical allegorical *and historical subjects born* Bucks County Pa also Quaker minister and sign painter
The Peaceable Kingdom P 31*a color picture* P 31

Hicks Elias (1748–1830) minister of Society of Friends born Hempstead Long Island *strong* advocate of abolition because of his liberal religious views Society divided for years into Orthodox and Hicksite Friends

Hicks Granville (born 1901) author born Exeter N H editorial staff *New Masses Magazine* 1934–39 edited letters of Lincoln Steffens (Great Tradition One of Us *Small Town*)

Hicksite Friends Quakers Q 2 *See also in Index* Hicks Elias

Hidalgo (*ē dal'gō*) Mexico state in central part 8057 sq mi pop 849 991 cap Pachuca mining textile manufacturers *map* M 195

Hidalgo y Costilla (*ē-dal'gō ē kos tē'yə*) Miguel (1753–1811) Mexican patriot priest L 113–14
leader of revolt M 206

Hidari (*hē'da rē*) **Jingorō** (1594–1634) Japanese artist M 353

Hidatsa Indians or **Minitari Indians** *See in Index* Gros Ventres

Hiddenite (*hĭd'n īt*) a transparent green variety of spodumene used *as a gem found in North Carolina*

Hide behind in folklore P 204

Hides *See in Index* Furs and *fur* trade Leather

Hide weed a seaweed *picture* S 94

Hideyoshi (*hē'da yō'shē*) **Toyotomi** (1536–98) Japanese warrior and statesman son of peasant became dictator of Japan as regent (1586)

Hierarchy (*hī'er ärk ĭ*) a body of *ecclesiastical rulers especially* applied to Roman Catholic clergy from pope to lower clergy

Hieratic writing a running form of Egyptian hieroglyphic writing E 285 *picture* W 310*a*

Hieroglyphics (*hī'er ō glĭf'ĭks*) pic*ture writing H 355* W 310 *picture* W 310*a* *See also in Index* Ideographic writing Picture writing
Egyptian E 285–6 *chart* A 177 *picture* W 310*a*
Mayan M 144 *pictures* W 310*a* S 76
Rosetta Stone L 285 6

Hieronymus *See in Index* Jerome Saint

High fidelity sound reproduction P 208

Higgins Edward J (1864 1947) English Salvation Army leader born Somerset received first commission at age of 18 elected commanding general 1929 resigned 1934

Higgins Frederick Robert (1896–1941) Irish poet born Oxford *County Mayo Ireland visited U S* in 1937 with Abbey Theatre players for whom he was managing director considered disciple of William Butler Yeats (The Dark Breed Arable Holdings)

Higginson Henry Lee *(1834 1919) banker* born New York City major in Civil War joined Lee Higginson & Co Boston bankers 1848 founded Boston Symphony Orchestra 1881 gave Soldiers Field and Harvard Union to Harvard University

Higginson Thomas Wentworth (1823–*1911*) author and Civil War soldier born Cambridge Mass colonel of first regiment of freed slaves (*Young Folks History of the* United States Cheerful Yesterdays)

High in weather forecasting W 81

High The street in Oxford England *picture* O 435

High-alumina brick B 304

High appellate court *or supreme* **court** a state court in U S C 500

High ball railroad term R 66

High Church popular term for that group in Anglican and Episcopal churches which stresses sacramental ritual and holds to doctrine *of apostolic succession*

High Court of Justice England C 501

Higher criticism applied to the Bible a detailed study of texts to determine their dates authorship and other features

Higher education *See in Index* College *University*

High fidelity in sound reproduction P 208

High frequency electric current R 40 1
from a magnetron E 321 *diagram* E 320
transmitting R 41

High German language G 82

Highhole a name for the flicker

Highland fling *one of Scotland's animated* national dances danced by three or four persons so called because of peculiar flinging action of steps as performer dances alternately on each leg *picture* S 83*a*

Highland Park Ill residential city on *Lake Michigan 25 mi n of* Chicago pop 16 808 Ravinia Park summer music center *map* I 36

Highland Park Mich automobile manufacturing city surrounded by Detroit pop 46 393 *map, inset* M 227

Highland Park Tex suburb of Dallas pop 11 403 *map inset* T 90

Highlands, in New Jersey N-156
Highlands, the part of Scotland n. of the Grampians: S-63, 63*c*, *maps* B-321, S-63, *pictures* S-62, 64
clothing S-63*a*, *picture* S-63*a*
Highlands of the Hudson, range of hills in s.e. New York, intersected by the Hudson River H-438
High latitudes C-350
High Peak, or **The Peak**, in Derbyshire, England; 2086 ft.; at southern end of Pennine chain.
High Point, N. C., city in n.-central part of state, 14 mi. s.w. of Greensboro; pop. 39,973; furniture, hosiery, textiles, machinery, glass paints; High Point College; *maps* N-274, U-253
furniture market F-319*a*
High Point College, at High Point, N.C.; Methodist; founded 1924; liberal arts.
High priest, Jewish, religious head of Hebrews, especially in Palestine at the time of the Temple of Solomon; guardian of the sanctuary. Aaron was regarded as first high priest. In postexilic times important political powers were exercised
breastplate of J-346
High relief, or **alto-relievo** (*ăl'tō rē-lē'vō*), in sculpture S-74
High school E-242–3, S-58
biology laboratory, *picture* E-238
chemistry laboratory, *picture* E-251
curriculum E-250–1
experiment E-251–2
core curriculum E-252; planning committee, *picture* E-253
dictionaries R-88*f*, *g*
distributive education V-502
gymnasium, *picture* E-252
income awards, *chart* E-239
junior high school E-256
libraries L-195
objectives E-251
safety education S-4, *picture* E-244
"High-school" horses H-428*h*, *picture* H-428*a*
High seas, ocean waters not included within the jurisdiction or boundaries of any nation.
High-speed tool alloys A-172–3, T-206, M-335
High-tension electric current, current under pressure of thousands of volts, *picture* E-293
power lines use E-312*b*
transformers T-167, E-305
X-ray tubes X-331–2
High wave, *table* R-30
Highway post office P-384–5
Highways. *See in Index* Roads and streets
High-wing plane. *See in Index* Aviation, *table* of terms
Hiiumaa (*hē'u-mä*), or **Dagö** (*dä'ō*), island of Estonia, in Baltic Sea, n. of Saare Island; 373 sq. mi.; farming, fishing; settled by Teutonic Knights in 1200; taken by Sweden 1563, by Russia 1721; occupied by Germany 1917; given to *Estonia 1918*; leased by Estonia to U.S.S.R. for military base 1939; *maps* E-417, R-266
Hiking, camper's rules C-63
Hilda, or **Hild**, **Saint** (*614–680*), English abbess, princess of Northumbria; founded monastery of Whitby, in N. Yorkshire; feast day November 17.
Hildebrand. *See in Index* Gregory VII, Hildebrand
Hildebrand (*hil'dĕ-brănt*), **Adolf von** (1847–1921), German sculptor; combined naturalism with classic forms; famous for youthful male figures and portrait busts ('The Problem of Form'); S-80
Hildesheim (*hil'dĕs-him*), Germany, town 21 mi. s.e. of Hanover; fine examples of late Gothic and Romanesque architecture; pop. 72,292; seat of bishopric, prominent in Middle Ages; *map* E-424
Hill, Ambrose Powell (1825–65), *soldier* born Culpeper County, Va.; served in Mexican and Seminole wars; lieutenant general in Confederate army; led division during Seven Days, 2d Bull Run, Antietam, and Fredericksburg battles; wounded at Chancellorsville; made commander of corps of Lee's army, which he led at Gettysburg and in Wilderness Campaign; killed at Petersburg
Gettysburg G-105
Harpers Ferry C-335
Hill, Daniel Harvey (1821–89), soldier and educator born York District, S. C.; served in Mexican War; attained rank of lieutenant general in Confederate army, conspicuous at Malvern Hill, South Mountain, Antietam, and Fredericksburg.
Hill, David Jayne (1850–1932), diplomat and historian born Plainfield, N.J.; assistant secretary of state 1898–1903, minister to Switzerland and Holland, ambassador to Germany ('History of Diplomacy in the International Development of Europe')
Hill, Mrs. Eben Clayton. *See in Index* Bailey, Carolyn Sherwin
Hill, Edward Burlingame (born 1872), composer and teacher born Cambridge, Mass., in music department at Harvard University 1908–40 when he retired; composed songs, sonatas, chamber music, symphonies
Hill, James Jerome (1838–1916), American railroad magnate H-355; fight for control of Northern Pacific S-399
memorial library S-24
Hill, Sir Rowland (1795–1879), English administrator, author of uniform "penny" postal system P-387, S-366
Hill, formed by erosion E-181
Hillary, Sir Edmund P(ercival) (born 1919), *British* beekeeper and mountain climber, born New Zealand; with Tensing Norkay won honor of being first men to reach summit of Mount Everest, climbed May 29, 1953, on British expedition led by Col. H. C. J. Hunt.
Hillbilly, *an* American colloquialism meaning a backwoodsman or a *mountaineer*, especially of s. United States.
Hillel (70? B.C.–A.D. 10?), Jewish rabbi, born Babylonia; president of the Sanhedrin in Jerusalem; noted for humility, gentleness, true piety.
Hiller, **Ferdinand** (1811–85), German pianist, conductor, and composer, born Frankfort-on-Main; established Cologne Conservatory; exerted influence as teacher and conductor.
Hiller (real name **Hüller**), **Johann Adam** (1728–1804), *German* composer and author, born Görlitz; founded singing school 1771
German Singspiel O-396
Hillis, Newell Dwight (1858–1929), clergyman and author, born Magnolia, Iowa; Plymouth Congregational Church, Brooklyn 1899–1924 ('Building a Working Faith'; 'Studies of the Great War').
Hillman, Sidney (1887–1946), American labor leader, born Lithuania; president Amalgamated Clothing Workers of America; director of labor division of Office of Production Management (later War Production Board) 1941–42; appointed adviser on labor matters to President Roosevelt 1942; chairman of PAC (Political Action Committee) 1943–46; *picture* R-214
Hillquit, Morris (1869–1933), American lawyer and Socialist leader, born Latvia ('History of Socialism in the U.S.'; 'Socialism Summed Up'; 'From Marx to Lenin').
Hillsdale College, at Hillsdale, Mich.; *founded 1844*; arts and sciences, music, home economics, business, nursery school.
Hillside, N.J., township between Newark and Elizabeth, pop. 21,067; steel, iron, and wood products, toilet preparations *map*, *inset* N-164
Hillyer, Robert S. (born 1895), poet born East Orange, N.J.; in English Dept. at Harvard University 1919–26, 1928–45 at Trinity College 1926–28 and at University of Delaware after 1952. Pulitzer prize (1934); author of symbolical novel 'Riverhead', verse in classic tradition, disciplined and thoughtful ('Collected Verse' A Letter to Robert Frost and Others').
Hilo (*hē'lō*), Hawaiian Islands, port on n.e. coast of Hawaii; pop. 27,198; H-288, *maps* H-286, P-17
anchorage H-264
Hilton, James (1900–1954), English *novelist*, born Leigh, Lancashire, England. In 'Good-bye, Mr. Chips', he pictured his schoolmaster father; employed unusual locale and characterization ('Lost Horizon'; 'Without Armor', 'Random Harvest'; 'So Well Remembered'; 'Time and Time Again')
Himachal Pradesh (*hi-mä'chal pra-dāsh'*), state in n.w. India, in w. Himalayas; area 10,451 sq. mi.; pop. 963,367; cap. Simla; formed by merging some of former princely states of Punjab States with most of former princely states of Punjab Hill States; consists of two parts, separated by Punjab state; *map* I-68*a*
Himalayan bear B-88
Himalayas (*hi-mä'la-yaz*), also **Himalaya**, the loftiest mountain system on earth, between India and Tibet; 1500 mi. long; highest point 29,028 ft.; H-355–6, *maps* A-406–7, 411, I-54, C-259, *picture* H-356
Mt. Everest E-450, *picture* A-409
plant life I-55
Himation (*hi-mät'i-ŏn*), Greek garment D-144, *picture* D-145
Himmler, Heinrich (1900–1945), officer and political leader, born Munich, Germany; joined National Socialist party 1919; deputy leader 1927 and Reichs leader of *Schutzstaffel* (S.S) 1929; chief of Gestapo and carried out "purge" 1934; minister of interior and chief of Reich administration, also head of People's Army; killed self when captured by British; G-99, *picture* W-250
Hinaidi, suburb of Baghdad, Iraq B-16
Hincks, Sir Francis (1807–85), Canadian journalist, financier, and statesman, born Ireland; prime minister 1851–54; governor of Barbados 1855–62, of British Guiana 1862–69; conspicuous leader in fight for responsible government; notable work as minister of finance; promoted reciprocity with the United States.
Hind, a female deer.
Hindemith (*hin'dĕ-mit*), **Paul** (born 1895), American composer, born Hanau, Germany (became U.S. citizen 1946); head of music department, Yale University, from 1942; compositions extremely modern in

style Operas chamber and vocal music author of A Composers World

Hindenburg Paul von (1847–1934) German general H 356–7 *pictures* H 354 G 99
chief commander W 228
president of Germany C 98
Russian front (1914) W 221

Hindenburg also **Zabrze** (*zäb' j'*) Poland former German industrial manufacturing city and mining center of coal and iron district in Silesia about 95 miles of Breslau pop 132 888 metal goods glass hemicals breweries in fuel region since 1945 *maps* E 416 424

Hindenburg a German dirigible B 31–2 34

Hindenburg line a strong defensive zone of trenches and strong points constructed by the German army in 1916 from a point near Soissons over Vimy Ridge to Lille sometimes taken to include the general defensive from Soissons east to Verdun W 226
before Arras A 388
broken in Meuse Argonne battle M 185

Hindi a form of Hindustani a language of India I 57
Bombay store sign *picture* I 61

Hindu Arabic number system or **Arabic number system** *See in Index* Number system *subhead* Hindu Arabic

Hindu architecture the building art developed under the influence of Brahmanism or Hinduism I 65 *pictures* I 66–7
Benares *picture* B 124

Hinduism H 357 I 58 *picture* A 415
animals venerated cobra C 372
hanuman monkey M 352 *picture* M 350
adherents flee Pakistan P 42
banyan tree held sacred B 54
Brahma B 278
caste system H 357 I 58
Ganges sacred G 10 bathing at Hardwar *picture* I 56
Himalayas home of the gods H 356
Java J 328
marriage custom M 101*a*
medical knowledge of Hindus M 164*b*
number system *See in Index* Number system *subhead* Hindu Arabic
pilgrimages B 123 *pictures* I 56–7
Siva *picture* I 58
suttee I 59
temple porch *picture* I 66

Hindu Kush (*hin dŭ kŭsh'*) a range of mountains in central Asia west of Himalayas highest point Tirich Mir 25 400 ft A 410, *maps* I 54 A 33 A 406
Afghanistan A 31

Hindu literature I 66

Hindus Maurice Gerschon (born 1891) writer born Bolshoye Bikovo Russia came to U S in 1905 revisited Russia many times began free lance writing 1917 (Russian Peasant and Revolution Moscow Skies To Sing with the Angels Mother Russia Russia and Japan Crisis in the Kremlin)

Hindustan Persian name for India, meaning land of the Hindus used for land n of Vindhya Mts or upper basin of the Ganges J 53

Hindustani a modern vernacular of the Indo Aryan group of the Indo European family of languages L 98 I 57

Hines Duncan (born 1880) author and publisher of guides for travelers born Bowling Green Ky books frequently revised (Adven tures in Good Eating Lodging for a Night Vacation Guide)

Hines John Leonard (born 1868) Army officer born White Sulphur Springs W Va served in Spanish American War in Philippines and in World War I made major general 1921 chief of staff of U S Army 1924–26 commander of Philippine Department 1930 retired from active service May 1932

Hinged oyster shell (*Spondylus crassicosta*) mollusk shell illus *picture* S 139

Hinkson Katharine Tynan *See* the *Index* Tynan Katharine

Hinnom Valley of or **Gehenna** in Palestine near Jerusalem J 335

Hinny a hybrid animal the offspring of a male horse and a female ass H 428*h*

Hinterland the land behind coast settlements which is dependent on them for trade in 19th century Germany claim to jurisdiction over such interior lands led to the rapid partition of Africa among the European powers

Hiogo Kobe Japan *See in Index* Kobe

Hip of rose F 232

Hip roof *See in Index* Architecture *table* of terms

Hipparchus (*hĭ pär'kŭs*) (died 514 B C) tyrant of Athens G 198

Hipparchus (2d century B C) Greek astronomer and mathematician founder of trigonometry discovered precession of equinoxes and invented method of fixing terrestrial positions by circles of latitude and longitude thus founding scientific geography A 443 L 313 G 65

Hippias (died 490 B C) Athenian tyrant C 198

Hippo North Africa *See in Index* Bone Algeria

Hippocastanaceae *See in Index* Horse chestnut family

Hippocrates (*hĭ pŏk'ra tēz*) (460?–377? B C) famous Greek physician called father of medicine first to dissociate medicine from superstition and to insist on scientific study of disease M 164*b*

Hippocratic Oath an oath presumably written by Hippocrates which has been an ethical guide of the medical profession since the time of Hippocrates M 164*b* It is as follows

I swear by Apollo the physician by Asculapius Hygeia and Panacea and I take to witness all the gods all the goddesses to keep according to my ability and my judgment the following Oath

To consider dear to me as my parents him who taught me this art to live in common with him and if necessary to share my goods with him to look upon his children as my own brothers to teach them this art if they so desire without fee or written promise to impart to my sons and the sons of the master who taught me and the disciples who have enrolled themselves and have agreed to the rules of the profession but to these alone the precepts and the instruction I will prescribe regimen for the good of my patients according to my *ability and my judgment* and never do harm to anyone To please no one will I prescribe a deadly drug nor give advice which may cause his death Nor will I give a woman a pessary to procure abortion But I will preserve the purity of my life and my art I will not cut for stone even for patients in whom the disease is manifest I will leave this operation to be performed by practitioners (*specialists in this art*) In every house where I come I will enter only for the good of my patients keeping *myself far from all intentional ill doing* and all seduction and especially from the pleasures of love with women or with men be they free or slaves All that may come to *my knowledge in the* exercise of my profession or in daily commerce with men which ought *not* to be spread abroad I will keep secret and will never *reveal* If I keep this oath faithfully *may* I enjoy my life and practice my art respected by all men and in all times But if I swerve from it or violate it may the reverse be my lot

Hippocrene (*hĭ pō krēn*) spring sacred to Muses P 111

Hippodrome (*hĭ pō drōm*) word from Greek meaning course for horse or *chariot racing most famous* ancient hippodromes were at Olympia *and Tarbu in modern times* term applied to large indoor amusement places as those in London and New York
circus during Justinian's time B 374

Hippolyta queen of the Amazons in Greek mythology wore famous girdle given her by father Ares in Shakespeare's Midsummer Night's Dream
Hercules kills H 342

Hippolytus (*hĭ pŏl' ĭ tŭs*) in Greek mythology son of Theseus *See also in Index* Phaedra

Hippopotamus also called **river horse** an amphibious mammal H 357–9 *pictures* H 358 A 43
ancestral relations F 244
hog related H 404
ivory from tusks I 284
length of life average *pictograph* A 249

Hirakud Dam in India on the Mahanadi River *See in Index* Dam *table*

Hiram King of Tyre about 1000 B C contemporary of David and Solomon raised Tyre to leading position in Phoenician Confederacy subjugated Cyprus
Solomon aided by P 205

Hiram College at Hiram Ohio founded 1850 arts and sciences Garfield at C 90

Hirohito (*hē-rō hē-tō*) (born 1901) emperor of Japan since 1926 appointed regent in 1921 broke age long precedent concerning heirs to throne by leaving native shores for trip through Europe in 1921 J 315 *picture* J 311

Hiroshige (*hē rō shē gē*) (1797–1858) Japanese artist J 317 D 140*d*

Hiroshima (*hē rō shē mä*) port at *s* end of Honshu Island Japan opposite sacred Island of Itsuku *Shima pop 295 712 trade in lacquer ware bronze maps* J 297 A 406 *pictures* J 302
atom bomb W 272

Hirpini (*hĕr-pī'nī*) ancient Samnite tribe *of s Italy revolted from Roman* conquerors and joined Carthaginians in 2d Punic War obtained Roman franchise after final defeat of Samnites by Sulla 83 B C

Hirsch Emil G (1852–1923) American rabbi born Luxemburg minister Sinai Congregation Chicago after 1880 professor rabbinical literature and philosophy University of Chicago after 1892 leader advanced Judaism and philanthropy

Hirsch Maurice baron de (1831–96)

Austrian financier and philanthropist; devoted millions to Jewish education, colonization, and charity in various countries.

Hirsch, Stefan (born 1899), American painter, born Nuremberg, Germany; first work cubistic and abstract; later work characterized by simple, direct composition intensified by clear-cut lines and curves; favorite subjects town and city scenes.

Hirundinidae (*hĭr-ŭn-dĭn'ĭ-dē*), the swallow family of birds; includes purple martin, cliff swallow, barn swallow, tree swallow, bank swallow, violet-green swallow

Hising, or von Hisinger (*hĭs'ĭn-gĕr*) **Wilhelm** (1766–1852), Swedish chemist, codiscoverer with Berzelius of cerium.

Hispania (*hĭs-pā'nĭ-a*), Roman name for Spanish peninsula.

Hispanic Society of America, society to promote the study of Spanish and Portuguese languages, literature, and art, founded in New York City in *1904*; membership honorary and restricted to 100 scholars of any *nationality*; maintains a reference *library of about* 100,000 volumes and an art museum which contains finest Hispanic collection in U S

Hispaniola (*hĭs-păn-yō'la*), island of West Indies; contains Haiti and Dominican Republic: H-244, 245, D-123, *maps* N-251, W-96–96*a*
Cortez in C-488
Las Casas' work for Indians L-105
relationships to continent, *maps* N-245–6, 248, 250–1, 257–8

Hispano-Moresque pottery, produced during Moorish era in Spain P-396*a*

Hissarlik (*hĭ-sär'lĭk*), place in n w. Turkey; site of ancient Troy: T-191
Schliemann's excavations S-57, T-191

Histadrut, Jewish labor federation of Palestine, founded 1920; comprises not only trade unions and co-operatives, but also social and cultural agencies; designed to create a labor commonwealth P-46–7

Histamine (*hĭs'ta-mēn*), an amine present in all vegetable and animal tissues
in allergic reaction A-170

Histogram, a chart, G-163, S-385*d*, *chart* G-163, *graph* S-385*d*

Histology, science of the tissues of animals and plants, also the microscopic study of the tissues A-239, Z-361

'Historia Regum Britanniae' (*hĭs-tō'rĭ-a rē'gŭm brĭ-tăn'ĭ-ē*) (History of the Kings of Britain), by Geoffrey of Monmouth A-394

Historic Age, *defined* A-300

Historic American Buildings Survey N-20

Historic Sites Act of 1935, U. S. N-20

History H-359–82, W-209–14, *charts* H-361–74, *pictures* H-375–82, *Reference-Outlines* H-375–82, W-212–14. *See also in Index* Archeology; Church, Christian; Civilization; Exploration; Middle Ages; Races of mankind; *also* names of countries, provinces, states, cities, *subhead* history; *also* Fact Summary with each state article
ancient A-240–1, *map* W-209, *Reference-Outline* A-240–1
archaeology aids study A-300–1
beginnings as a science H-360, G-211
begins with art of writing M-63
children's book and L-208
Christianity, influence of C-301–4
civilization, development of C-324–9, *pictures* C-325–6
communication influences C-424*b–c*
current events, *pictures* H-375–82, *Reference-Outline* H-375–82
dates fixed by eclipses E-210
Father of History H-349
Marx's economic interpretation M-105
medieval M-236–8, *Reference-Outline* M-238*h–9*
migration a factor in M-245–6
Muse of M-454
pageant, historical P-19*a*
social sciences include S-221
warfare W-8–10, *pictures* W-8–10
world history W-209–14, *charts* H-361–74, *Reference-Outline* W-212–14

'History of Goody Two-Shoes, The', a children's story supposed to have been written by Oliver Goldsmith L-270

Hit, Iraq, ancient town on w bank of Euphrates about 90 mi n w of Baghdad pop about 8000 asphalt deposits in vicinity *maps* A-285, I-224

Hit, in baseball B-65

Hitch, temporary *rope fastening* K-61

Hitchcock, Gilbert Monell (1859–1934), American newspaper publisher and Democratic political leader founded *Omaha World Herald* U S senator 1911–23 as chairman of senate foreign relations committee supported Versailles Treaty and League of Nations

Hitchcock chair F-320

Hite, Jost (*died 1760*), American colonizer *born Strasbourg Alsace*, emigrated because of religious persecution founded settlements in New York, Pennsylvania, and Virginia

Hitler, Adolf (*1889–1945*) chancellor and dictator of Germany H-383–5, G-98–100, R-291, W-244, *pictures* H-383–4, G-99, W-247, *252*. *See also in Index* World War II
Berlin, *plans to transform* B-128
'Mein Kampf' H-383–5, W-246
Munich M-449, 450
Nuremberg celebrations N-314

Hittites (*hĭt'ĭts*), *ancient people of* Asia Minor H-385–6, *pictures* H-385–6
chariot in warfare W-8
iron used by I-246, H-386
land where they lived, *map* B-6
languages deciphered A-300–1, H-385–6

Hittorf (*hĭt'ôrf*), **Johann Wilhelm** (1824–1914), German physicist; pioneer in electrochemistry and X rays.

'Hitty', children's story by Rachel Lyman Field L-216*b*, *picture* L-269

Hiva Oa (*hē'vä ō'a*), a Pacific island; largest of the southern Marquesas; *pop. 836 map* P-17

Hivites (*hī'vĭts*), in Old Testament, one of the Canaanite peoples who inhabited Palestine before the arrival of the Israelites.

Hi-Y Clubs, clubs organized among high school boys and affiliated with the Young Men's Christian Association, with purpose "to create, maintain, and extend throughout the school and community, high standards of Christian character." Bible study and various other activities are carried on The name Hi-Y Club was first used in 1914
citizenship program, *picture* C-320

Hjelm (*hyĕlm*), **Peter Jacob** (1746–1813), Swedish chemist who isolated *molybdenum*.

Hjelmar also **Hjalmar** (*yĕl'mär*), lake in Sweden, about 40 mi. w. of Stockholm; connected with Lake Malar both naturally and artificially; area 185 sq. mi.

Hoang Ho, river in China. *See in Index* Hwang Ho

Hoar, George Frisbie (1826–1904), statesman born Concord, Mass.; "Free Soiler" and anti-Imperialist; representative and senator from Massachusetts 1869–1901 ('Autobiography of Seventy Years').

Hoare, Samuel, Viscount Templewood (born 1880), British statesman; entered Parliament 1910; air secretary 1922–29; secretary for India 1931–35; foreign secretary under Baldwin 1935, forced to resign by criticism of Hoare-Laval plan for dismemberment of Ethiopia; home secretary 1937–10; ambassador to Spain 1940–44.

Hoarfrost F-303

Hoarhound. *See in Index* Horehound

Hoary alder. *See in Index* Speckled alder

Hoatzin (*hō-ät'sĭn*), a South American bird, *pictures* B-157

Hoban, James (1762?–1831), architect, designer of White House W-122

Ho'bart, Alice Tisdale (born 1882), novelist, born Lockport, N.Y.; in China 16 years ('Oil for the Lamps of China'; 'The Peacock Sheds His Tail'; 'The Cleft Rock'; 'The Serpent-wreathed Staff').

Hobart, Garret Augustus (1844–99), Republican party leader, born Long Branch, N J.
vice-president of U. S. *See in Index* Vice-president, *table*

Hobart, Ind., *city* 7 mi. s e. *of* Gary; pop 10,241: *map* I-78

Hobart, capital and largest city of Tasmania, on s coast, 12 mi. above mouth of Derwent River; pop. 76,567; University of Tasmania: T-22, *map* A-489
pontoon bridge. *See in Index* Bridge, *table*

Hobart College, at Geneva, N. Y.; Episcopalian; for men (co-ordinate with William Smith College for women); founded 1822; arts and sciences; graduate studies

Hobbema (*hŏb'ĕ-mä*), **Meindert** (1638–1709), Dutch landscape painter, influenced by Van Ruisdael ('Avenue, Middelharnis'; 'Entrance to a Village').

Hobbes, John Oliver, pen name of Pearl Mary Teresa Craigie (1867–1906), English novelist and dramatist, born Boston, Mass.; vivid style, sparkling with epigrams and caustic humor ('Some Emotions and a Moral'; 'The Ambassador').

Hobbes, Thomas (1588–1679), English philosopher; famous for system of political and ethical philosophy; called "father of empirical psychology"; most noted work 'The Leviathan', treatise on philosophy of government: P-360

Hobblebush. *See in Index* Wayfaring tree

Hobbs, N. M., city in extreme s e; pop 13,873; petroleum industry: *maps* N-179, U-252

Hobby, Oveta Culp (born 1905), government official and publisher, born Killeen, Tex.; parliamentarian Texas House of Representatives 1925–31, 1939–41; joined *The Houston Post* as research editor 1931, became executive vice-president 1938, publisher 1952; first director Women's Army Auxiliary Corps (later Women's Army Corps) 1942–45; U.S secretary of health education, and welfare 1953–55: *picture* H-375

Hobby, an activity outside his work in which a person is especially interested H-387–401, *pictures* H-387–90, 392, 394, 397–401
books H-388–401, I-148, L-207–17, N-68*b–9*
leisure-time activities L-159–61

Hobhouse, L. T. (1864–1929), English sociologist S-222

Hobkirk's Hill battle of British defeated Americans under Greene 1781 n of Camden S C also called 2d battle of Camden

Hoboken N J port of entry railroad and industrial center opposite New York City on Hudson River pop 50 676 terminus of several important steamship lines and coal shipping point Stevens Institute of Technology 21 [illegible] ve N 164 water front *picture* N 158

Hobson Flura Zametkin novelist born New York City n] ron tion staff Time Inc 1934 40 known for Gentlemen's Agreement novel of protest against anti Semitism also wrote The Other Father and The Celebrity

Hobson Richmond Pearson (1870–1937) Navy hero born Greensboro Ala graduated U S Naval Academy in Spanish American War sunk collier *Merrimac* in attempt to close Santiago harbor in charge of various naval construction member of Congress from Alabama 1907 15 after as lecturer and writer (The Sinking of the Merrimac)

Hobson's choice phrase meaning this or nothing originated from fact that Thomas Hobson (1544–1630) a stablekeeper of Cambridge England made each customer hire the horse nearest the door

Hochelaga (*hosh ĕ lag' ă*) Canada early Indian village at mouth of Ottawa River
Cartier at C 130

Ho Chi Minh (*hō' chē' mĭn'*) (born 1891?) Indo Chinese political leader organized Viet Nam insurrection 1930 proclaimed Democratic Republic of Viet Nam 1945 I 125 6

Hochkirch (*hŏk' kĭrk'*) Germany village 30 mi ne of Dresden where Austrians defeated Prussians under Frederick the Great 1758 (Seven Years War)

Hochstadt (*hŏk' shtĕt*) **on the Danube** Germany town in Bavaria 60 mi nw of Munich battle of Blenheim *1704*

Hock or **hock joint**
dog *picture* D 110b
horse *picture* H 428a

Hockey H 402 *picture* H 402

Hocking River a stream in se Ohio flowing into the Ohio River about 100 mi long *map* O 357

Hoc signo vince (In this sign conquer) C 456

Hodag in folklore F 204

Hodeida (*hō dā' ĭ dă*) fortified sea port of Yemen Arabia *on Red Sea* pop 26 000 center of coffee trade *maps* A 285 A 407

Hoder in Norse mythology blind god who slew Balder B 20

Hodgenville Ky town 49 mi s of Louisville pop 1695 L 246 *map* K 30
Abraham Lincoln National Historical Park N 30 *map* N 18 *picture* K 34

Hodges Courtney H (born 1887) U S Army officer born Perry Ga from private in U S Army (1906) advanced through ranks *to four star general* (1945) commanded American 1st Army in World War II retired 1949

Hodges George (1856–1918) *Episcopal* clergyman and author born *Rome N Y at* Calvary Church *Pittsburgh* 1881 94 dean Episcopal Theological School Cambridge *Mass 1894 until death* (The Human Nature of the Saints Everyman's Religion)

Hodgson Ralph (born 1871) English poet born Northumberland poems are powerful and direct (The Last Blackbird and Other Lines *Eve* and Other Poems)

Hodler (*Hod' lĕr*) **Ferdinand** (1853–*1918*) Swiss painter and lithographer leader among Swiss moderns vigorous simplicity in landscapes *figures portraits*

Hódmezővásárhely (*hōd' mĕ zĕ' vă' sär hĕ' lyĕ*) agricultural town in se Hungary 15 mi ne of Szeged pop 59 340 *map* E 425

Hoe Richard March (1812–86) manufacturer and inventor born New York City with his brothers Peter S and Robert made many contributions to development of printing press P 414*d*

Hoecake form of corn bread P 263

Hoek van Holland *See in Index* Hook *of Holland*

Hoenir (*Hu' nĭr*) in Norse mythology god who with Odin and Loki *created* first man Ask and first woman Embla from trees in Midgard from *Odin* they obtained life from Hoenir mind and from Loki the senses
Ymar and N 232

Hofburg palace in Vienna V 471 472

Hofer Andreas (1767 1810) Tyrolese patriot and hero leader in insurrection against Bavaria betrayed court martialed and *shot T 232b*

Hofer Karl (1878 1955) German artist some works are in Flemish tradition others suggestive of Cézanne or Picasso and still others *abstract* and expressionistic favorite subjects circus life nudes portraits still life and interiors

Hoff Jacobus Hendricus Van't *See in Index* Van't Hoff

Höffding (*hœf' dĭng*) **Harald** (1843–1931) Danish philosopher (History of Modern Philosophy Philosophy of *Religion*)

Hoffenstein Samuel (1890–1947) American poet and motion picture writer born Lithuania wrote light verse (Poems in Praise of Practically Nothing)

Hoffman Charles Fenno (1806–84) *newspaper* and magazine editor novelist, poet born New York City (A Winter in the West Greyslaer a Romance of the Mohawk)

Hoffman Ernst Theodor Amadeus (1776–1822) German novelist and composer leader in romantic movement best known for gruesome tales of the supernatural (The Devil's Elixir)

Hoffman Josef Franz M (born 1870) Viennese modernist architect structural austerity relieved by surface decorative patterns and rich *color* noted chiefly for precisely proportioned industrial buildings

Hoffman Malvina (Mrs Samuel B Grimson) (born 1887) sculptor born New York City author Heads and Tales an autobiography (portraits of Paderewski Pavlova groups and single figures illustrating racial types for Chicago Natural History Museum)
sculptures *picture* I 108a

Hoffman Paul Gray (born 1891) business executive and public official born Chicago Ill president Studebaker Corporation 1935–48 became chairman Committee for Economic Development 1942 head of Economic Cooperation Administration 1948 50 president of Ford Foundation 1950–53 board chairman of Studebaker Corporation 1953–54 of Studebaker Packard Corporation 1954

Hoffmann August Heinrich (1798–1874) called Hoffmann von Fallersleben *German poet and philologist* wrote verses to Deutschland über *Alles*

Hoffmann Tales of opera by Jacques Offenbach
story O 393

Hoffmann von Fallersleben *See in Index* Hoffmann August Heinrich

Hofmann August Wilhelm von (1818–92) German chemist who *helped to found* German coal tar industry discovered benzol in coal tar (1845)

Hofmann Heinrich (1824 1911) German historical and portrait painter popular for ideal conceptions of life of Christ also for *paintings from* mythology
Christ in the Temple *picture* J 339

Hofmann Josef (born 1876) American pianist and composer born Cracow Poland an infant *prodigy* at six successful concert tour of Europe at nine director Curtis Institute of Music Philadelphia 1905 38 compositions for piano and orchestra

Hofmannsthal (*Hōf' mänz tăl*) **Hugo von** (1874–1929) Austrian neoromantic dramatist and poet *dealt* chiefly with imaginative world ("The Death of Titian one of his best plays Elektra and The Rose Cavalier used as librettos for operas by Richard Strauss)
The Rose Cavalier *story O 393*

Hofmeister Wilhelm (1824 77) German botanist born *Leipzig described* fertilization and embryo formation in plants discovered alternation of generations in *life* cycle of ferns mosses and other cryptogams

Hofstra College at Hempstead L I N Y founded 1935 granted absolute charter 1940 arts *and sciences* business administration education

Hofuf (*Hō fōf'*) city in Arabia 40 mi *from Persian Gulf pop* 100 000 *maps* A 285 A 408

Hog a domesticated mammal of the swine family H 402–4 *pictures* H 403–4
ancestral relations F 244 H 403–4 *P 406c picture F 406d*
breeding effect of H 403–4 *pictures* A 62 *famous breeds H 404*
cattle compared to as meat producer H 403
cholera control H 404
destroys rattlesnakes P 78
draft animal in China H 403
feet H 403 corn C 484
feeding color picture U 285
food production and marketing H 403 lard and bacon types H 404
mother saves young from drowning *picture N 58*
parasite *picture* P 79 tapeworm W 302 trichina W 303 H 404
producing regions H 404 U S *map* U 289
products H 403 bristles B 330 lard H 403 P 44–5 meat packing M 152–6 *picture* M 156b pigskin H 403 L 150 G 126
vaccines inoculating *picture* V 433a

Hogan Ben (born 1912) professional golfer born Stephenville Tex in 1948 became first golfer to win the following tournaments in one season Professional Golfers Association U S Open Western Open

Hogan house of Navajo Indians I 104c *picture* A 356 *color picture I 104a*

Hogarth William (1697–1764) English painter and engraver H 405, *P 293*

'The Graham Children' P-29*d*, *color picture* P-29*c*
works, *pictures* E-369*a–b*, H-405
Hogbacks, in geology R-176
Hogben, Lancelot (born 1895), English zoologist and writer, professor of natural history at Aberdeen University 1937–41, of zoology at Birmingham University after 1942; stressed practical and social significance of science in 'Mathematics for the Millions' and 'Science for the Citizen'.
Hog cholera, an infectious bacterial disease afflicting swine; causes diphtheritic condition of intestine
loss from, and control H-404
Hoge (*hōj*), **William Morris** (born 1894), U. S. Army officer and civil engineer, born Boonville, Mo; in World Wars I and II; commanding general in charge of construction of Alaska Highway 1942; became 4-star general 1953; commanding general U. S. Army in Europe 1953–.
Hogfish, Spanish. *See in Index* Spanish hogfish
Hogg, James (1770–1835), the "Ettrick Shepherd," Scottish peasant poet ('Scottish Pastorals'; 'The Mountain Bard'; 'The Queen's Wake'; 'Pilgrims of the Sun'; 'The Poetic Mirror').
Hogging down, in corn harvesting C-484
Hog Island, partly in Delaware Co., Pa., and partly in s. Philadelphia, Pa.; municipal airport
World War I shipyard W-236, *picture* W-234
Hogmanay Day F-59
Hog-nosed snake S-209
Hog score, in curling C-530
Hogshead, a unit of liquid measure, *table* W-87
Hogue, La, battle of. *See in Index* La Hogue
Hogweed. *See in Index* Ragweed
Hohenfriedeberg (*hō-ĕn-frē'dŭ-bĕrg*), Poland, former German town in Silesia, 36 mi. s.w. of Breslau; victory of Frederick the Great over Austrians and Saxons 1745 in War of Austrian Succession; included in Poland since 1945.
Hohenheim, Theophrastus Bombastus von. *See in Index* Paracelsus
Hohenlinden (*hō-ĕn-lĭn'dĕn*), Germany, village in Upper Bavaria, 19 mi. e. of Munich; French victory over Austrians in 1800.
Hohenstaufen (*hō'ĕn-shtou-fĕn*), a noble German family of the Middle Ages H-406, F-281, 282. For list of Hohenstaufen emperors, *see in Index* Holy Roman Empire, *table*
Ghibellines G-222*d*
Hohenzollern (*hō'ĕn-tsōl-ĕrn*), a noble German family H-406. For list of Hohenzollern kings, *see in Index* Prussia, *table*
growth of power P-424–424*a*
overthrow W-136
Hohenzollern, former district of Prussia; 441 sq. mi.; 1950 pop. 85,863; after World War II became part of Württemberg-Hohenzollern: H-406
Hohe Tauern (*hō'ĕ tou'ĕrn*), range of Eastern Alps; also, a summit (5080 ft.) in this range: T-232*b*
Hohokam culture, of prehistoric North American Indians I-109, *picture* I-108*e*
Hokkaido (*hō-kī'dō*), or **Hokushu**, northernmost large island of Japan; 30,328 sq. mi.; pop. 4,295,567; *maps* J-297, A-406
Ainu men, *picture* J-298
climate J-296
coal mine, *picture* J-307
farming J-306
Hokku, Japanese poetry form J-312
Hokusai (*hō-ku-sī*) **Katsushika** (*kă-tsu-shĭ-kă*) (1760–1849), Japanese artist, born Yedo, Japan J-317, D-140*d*
print J-314, *color picture* J-315
Holbein (*hōl'bīn*), **Hans**, the Elder (1460–1524), German painter, best known for 'The Basilica of St. Paul' and a 'Passion' in 11 scenes; his later work shows Italian influence grafted on the Flemish of his youth.
Holbein, Hans, the Younger (1497–1543) German painter son of Hans the Elder H-406, P-29*b*
'Anne of Cleves' P-27*b*, *color picture* P-27*b*
mural, *picture* M-238*b*
portrait of Erasmus, *picture* R-106
portrait of Nicholas Kratzer, *picture* H-406
wood engraving E-386
Holberg (*hōl-bĕrg'*), **Ludvig, Baron** (1684–1754), Norwegian-Danish dramatist, historian, and philosopher, called the Molière of the North; made Danish a literary language, had vast influence over his countrymen ('Subterranean Journey of Niels Klim'; 'Comedies').
Holboell's grebe G-187
Holborn (*hō'bŏrn*), England, metropolitan borough in central part of London; pop. 24,806; contains Lincoln's Inn and Gray's Inn
Holbrook, Josiah (1788–1854), educational reformer, born Derby, Conn., founded American Lyceum; tried unsuccessfully to found "Lyceum City" at Berea, Ohio: C-205
HOLC (Home Owners' Loan Corporation), U.S. R-205
Holcomb, Thomas (*born 1879*), U.S. Marine officer, born New Castle, Del.; in World War I; commandant of Marine Corps Schools, Quantico, Va., 1935–36; commandant U.S. Marine Corps *1936–43*; U.S. minister to Union of South Africa *1944–48*; retired *1948*.
Hold. *See in Index* Nautical terms, *table*
Holden, Edward Singleton (*1846–1914*), *astronomer*, born St. Louis, Mo.; president of University of California 1885–88; did most important work as director of Lick Observatory, Calif., *1888–98*; librarian of U.S. Military Academy, West Point, after 1901.
Holding company, a company which owns securities of one or more other companies and is thus in a position to control their management M-360
Holds, in wrestling, *pictures* W-305–6
Hole-in-one, in golf G-136
Holidays H-407. *See also in Index* Festivals and holidays
Hollinshed (*hŏl'ĭnz-hĕd* or *hŏl'ĭn-shĕd*), or **Hollingshead, Raphael** (died 1580), English chronicler, compiler of 'Chronicles of England, Scotland and Ireland', now valued because it was a source book for the Elizabethan dramatists
Shakespeare's debt to S-124
Holland, Clifford M. (1883–1924), engineer, born Somerset, Mass.; authority on underwater tunnels; assistant engineer in building East River tunnels, *1906–7*; chief engineer of vehicular tunnel under Hudson River between New York and New Jersey, completed and named for him after his death.
Holland, John Philip (*1840–1914*), American inventor, born Ireland
submarine development S-437, P-97
Holland, Josiah Gilbert (1819–81), editor and author, born Belchertown, Mass. ('Bittersweet'; 'Sevenoaks').
Holland, Mich., port and manufacturing city at head of Black Lake, 25 mi. s.w. of Grand Rapids; pop. 15,858; grain market, leather, woodenware, furniture, flour, beet sugar; Hope College, Western Theological Seminary: *map* M-227
tulip festival, *pictures* C-354, M-218
Holland, North and South, chief provinces of the Netherlands H-407. *See also in Index* Netherlands
Holland, Parts of, administrative district in Lincoln County, England: *map* E-347
Holland cloth, a cotton or linen cloth, usually glazed or heavily sized; used for window shades.
Hollandia, administrative center for Dutch New Guinea, on n. e. coast: *maps* E-203, P-16
World War II W-268
Holland Tunnel, New York City T-*209*, N-224, *map* B-329, *picture* N-223
Holles, Denzil Holles, Baron (1599–1680), English parliamentary leader active in opposing Stuart tyranny; imprisoned 1629 for anticrown demonstration in the Commons, he denied court's jurisdiction over acts committed in Parliament; helped Pym draw up Grand Remonstrance; active in Civil War but opposed Cromwell and army policy.
Holley, Marietta (1850–1926), author, born Jefferson County, N. Y.; wrote amusing stories concerning 'Samantha', and 'Josiah Allen's Wife'.
Holling, Holling Clancy (born 1900), illustrator and author of children's books; grew up on Michigan farm; worked as scientist with Field Museum of Natural History; in his 'Book of Indians' and 'Book of Cowboys', his wife, **Lucille Webster Holling**, helped with the illustrations ('Paddle-to-the-Sea'; 'Seabird'; 'Minn of the Mississippi').
Hollingshead, Raphael. *See in Index* Holinshed
Hollins College, at Hollins College, Va.; founded 1842; for women; arts and sciences.
Hollow gravity dam D-10, *diagrams* D-8, *pictures* D-8
Hollow grinding, grinding a razor or other cutting tool with a slightly concave surface on each side of the cutting edge to enhance cutting power.
Holly, evergreen or deciduous trees or shrubs H-407
Christmas customs, origin C-294*a*
used for yerba maté T-32
Holly family, or Aquifoliaceae (*ăk-ĭ-fō-lĭ-ā'sē-ē*), a family of trees and shrubs, native chiefly to Western Hemisphere, including holly, yaupon, black alder, winterberry, and Ilex paraguariensis, the source of yerba maté.
Hollyhock, a garden plant H-407
how to plant, *table* G-16
Hollywood, Calif., part of Los Angeles; formerly separate town, annexed 1910; center for motion-picture industry; annual production of Pilgrimage Play: *map, inset* C-35
Hollywood Bowl, *picture* C-32
NBC building, *picture* L-315
Hollywood, Fla., city 18 mi. n.e. of Miami, on Atlantic; pop. 14,351; resort; fishing, dog and horse racing; electronics, apparel, headwear; winter home, Riverside Military Academy: *map* F-159
Hollywood Bowl, Los Angeles, Calif., 60-acre natural amphitheater; musical and dramatic functions held here include symphonies, operas, and the Easter sunrise service: *picture* C-32
Holm, Hanya, American dancer, choreographer, and teacher, born Worms, Germany; studied wth Mary Wigman; came to U.S. 1931; important

work at Bennington College Vermont D 144

Holme Constance (Mrs Frederick *Burt Lanchard*) English novelist, born in village of Milnthorpe Westmorland which is the setting of her distinctive novels The Old Road from Spain The Trumpet in the Dust Beautiful End *Festina Vie Heureuse* joint award (1921) for The Splendid Fairing *a* best piece of imaginative English by author whose work had formerly been neglected

Holmes (Elias) Burton (born 1870) traveler and lecturer born Chicago Ill lectures called The Burton Holmes Travelogues autobiography The World Is Mine

Holmes John Haynes (born 1879) clergyman and author born Philadelphia Pa originally Unitarian became independent 1919 pastor Church of the Messiah New York City later called The Community Church 1907–41 (The Crail of Life Palestine Today and Tomorrow Rethinking Religion Sensible Man's View of Religion)

Holmes Mary Jane (1825–1907) writer of highly sentimental novels of domestic life born Brookfield Mass (Tempest and Sunshine Lena Rivers) A 229

Holmes Oliver Wendell (1809–94) *American poet and essayist* H 407 8 A 226*d–e*
anesthetics handled by A 248
Hall of Fame *table* H 249
invents open stereoscope S 392
quoted A 226*c e* E 339 W 312

Holmes Oliver Wendell (1841–1935) *American jurist* H 408 *picture* H 408

Holmes Sherlock in Conan Doyle's detective stories marvelous amateur detective who unravels the most baffling mysteries

Holmes William Henry (1846–1933) anthropologist and artist born Harrison County Ohio pioneer investigator of archaeology of the Southwest made important contributions on *Indian art* developed fine museum exhibits chief Bureau of American Ethnology curator anthropology U S National) Museum and National Gallery of Art (Handbook of Aboriginal American Antiquities Pottery of the Ancient Pueblos)

Holmium a chemical element *tables* P 151 C 214

Holocene (*hol'ō sēn*) *epoch* in geology the period of recent *time* including the present *diagram* C 58 *table* G 57

Holofernes (*hŏl'ō fer'nēz*) Assyrian general slain by Judith story told in book of Judith in the Roman Catholic Bible and in the Protestant *Old Testament* Apocrypha

Holograph will in law W 134

Holothuroidea (*hŏl'ō thū roid'ē ə*) a class of echinoderm animals including sea cucumbers

Holst Axel (1860–1931) Norwegian chemist and physician associate of *Dr Theodor Frölich*
experiments with scurvy V 497

Holst Gustav Theodore (1874–1934) English composer of Swedish descent born *Cheltenham* Gloucestershire musical settings for poems (Hymns from the Rig Veda Ode to Death) choral works (Hymn of Jesus) great orchestral *suite* (The Planets) operas (The Perfect Fool)

Holstein (*hōl'stīn*) former duchy since 1866 part of Schleswig Holstein *See also in Index* Schleswig Holstein

Holstein Friesian or **Holstein** dairy breed of cattle C 144 *pictures* C 141*b* D 4 I 85 *color picture* M 250*d* *table* C 142
composition of milk *table* C 143

Holston River branch of Tennessee River rises in s w Virginia and flows 200 mi s w into e Tennessee *maps* T 59 67

Holt Hamilton (1879–1951) editor and educator born Brooklyn N Y editor and owner *The Independent* 1913–21 president Rollins College (Winter Park Fla) 1925–49 then president emeritus (Undistinguished Americans)

Holt L(uther) Emmet (1855–1924) physician born Webster N Y authority on care of children (The *Care and Feeding* of Children Diseases of Infancy and Childhood)

Holy Alliance league formed 1815 by sovereigns of Russia Austria and Prussia *E 453 See also in Index* Treaties *table*
Alexander I part of A 147
Monroe Doctrine and M 365

Holy Anthony The engraving by Dürer *picture* E 385

Holy City (Jerusalem) J 335–8 *pictures* J 335–8

Holy Cross College of the at Worcester Mass Roman Catholic for men founded 1843 arts and sciences

Holy Cross Mount of the peak of the Rocky Mountains in Eagle County Colo (13 996 ft) *maps* C 402 408

Holy Eucharist (*yū'kə rist*) or **Lord's Supper** in Christian church a sacrament in which bread and wine are taken *in commemoration* of Christ's death

Holy Family, by Michelangelo *picture* M 213

Holy Grail or **Sangreal** *legendary cup* used by Christ at Last Supper G 1–3
Arthurian legends G 1–3 R 236 A 394 *pictures* A 393–4

Holyhead Welsh port on Holy Island just w of Anglesey pop 10 569 *map* B 325

Holy Lance lance which pierced Savior at Crucifixion (John xix 34) legend about C 519

Holy Land Palestine *See also Index* Palestine

Holy League (1511) formed by Pope Julius II Ferdinand II *of Spain* and Venice to free Italy from French rule later joined by Emperor Maximilian and Henry VIII

Holy League *(Catholic League)* formed 1576 ostensibly to suppress Huguenots and to support Roman Catholic religion in France but *chiefly* to place leader Henry duke of Guise on throne later led by Henry III disbanded 1595
opposes Henry of Navarre H 339

Holy Names College of the at Oakland Calif Roman Catholic for women founded 1880 arts and sciences

Holy Names College at Spokane Wash Roman Catholic for women opened 1907 arts and sciences education

Holyoake (*hŏl'yōk*) **George J** (1817–1906) English writer and reformer championed co operative movement *and secularism last person to be* imprisoned in England for blasphemy

Holy Office Congregation of the judicial body of Roman Catholic church headed by the pope and a cardinal censors and condemns dangerous books passes judgment on heresy mixed marriages and questions of dispensation I 151

Holyoke Mass city 8 mi n of Springfield on Connecticut River noted for its paper mills pop 54 661 silks textiles thread machinery *map* M 132

Holyoke Mount a steep hill 6 mi n of Holyoke Mass famous for view of Connecticut Valley from its summit 954 ft high *map* M 124

Holy orders a sacrament C 302

Holy Roman Empire H 408–9 A 496–7 *See also in Index* Austria Germany history of *also* emperors by name *For list of rulers of the* Holy Roman Empire *see table* on this page
Charlemagne founds H 408 C 166–8

RULERS OF THE HOLY ROMAN EMPIRE

Reign		Reign	
Saxon Line		1298–1308	Albert I of Hapsburg
800–814	Charlemagne	1308–1313	Henry VII of Luxemburg
814–840	*Louis the Pious*	1314–1347	Louis IV of Bavaria (rival claimants)
840–911	Later Carolingians	1314–1330	Frederick the Fair of Austria (rival claimants)
911–918	Conrad I	**Luxemburg Line**	
Saxon Line		1347–1378	Charles IV
919–936	Henry I the Fowler	1378–1400	Wenceslaus
936–973	Otto I the Great	1400–1410	Ruprecht of the Palatinate
973–983	Otto II	1410–1437	Sigismund
983–1002	Otto III	**Hapsburg Line**	
1002–1024	Henry II	1438–1439	*Albert II*
Franconian Line		1440–1493	Frederick III
1024–1039	Conrad II	1493–1519	Maximilian I
1039–1056	Henry III	1519–1556	Charles V
1056–1106	Henry IV	1556–1564	*Ferdinand I*
1106–1125	Henry V	1564–1576	Maximilian II
[1125–1137	Lothair II of Saxony]	1576–1612	Rudolph II
Hohenstaufen Line		1612–1619	Matthias
1138–1152	Conrad III	1619–1637	*Ferdinand II*
1152–1190	Frederick I (Barbarossa)	1637–1657	Ferdinand III
1190–1197	Henry VI	1658–1705	Leopold I
1198–1208	Philip of Swabia (rival claimants)	1705–1711	Joseph I
1198–1214	Otto IV (rival claimants)	1711–1740	Charles VI
1215–1250	Frederick II	[1742–1745	Charles VII of Bavaria]
1251–1254	Conrad IV	1745–1765	Francis I
[1254–1273	Great Interregnum]	1765–1790	Joseph II
Rulers from Various Houses		1790–1792	Leopold II
1273–1291	Rudolph of Hapsburg	1792–1806	Francis II (after 1806 reigned as Francis I of Austria)
1292–1298	Adolf of Nassau		

coronation chair A-1
effect of Thirty Years' War E-432
end of (1806) A-498
Golden Bull G-97
Guelfs and Ghibellines G-222*d*
Hapsburgs H-261–2: Charles V C-189–90
Hohenstaufens H-406: Frederick Barbarossa F-281
Innocent III I-151, O-430
investiture conflict G-214–15: Henry IV and Henry V H-33*a*–5
Otto I revives O-430
Holyrood Palace, Edinburgh, Scotland E-234
Holy Saturday E-200
Holy See. *See in Index* See
Holy Sepulcher (*sĕp'ŭl-kẽr*), in Jerusalem J-336
Crusades C-519–22, *pictures* C-520–1
Holy Sepulcher, Church of the, Jerusalem J-336
Holy Sepulcher, Order of the. *See in Index* Order of the Holy Sepulcher
Holy Thursday, or Maundy Thursday E-200
Holy water, water blessed by priest and used by Roman Catholics, Greek Orthodox, and some Anglicans in making the sign of the cross; used also in ceremonies and sacraments.
Holy Week E-200
Holz (*hŏlts*), **Arno** (1863–1929), German poet, critic, leader in German naturalism; sought to free language from conventionality; rejected rhyme and strophe in verse.
Homage, a feudal ceremony F-61
Home Affairs, Secretary of State for, in British cabinet C-4
Home and school
kindergarten link between K-41
Parent-Teacher Associations P-80
Home demonstration agent, woman trained in home economics working in county in Extension Service. Works with individuals and with women's groups, such as Home Demonstration Clubs, mainly in rural areas. Takes leadership in study of food, nutrition, and clothing, and aids in other activities for community betterment. Assists 4-H Clubs. Number of counties employing home demonstration agents in 1954, 2589; F-32. *See also in Index* Federal Extension Service
Home Demonstration Clubs, American women's organizations, chiefly in rural areas, in connection with Extension Service. Programs are usually planned locally and are directed by home demonstration agents and local leaders. While programs are devoted largely to food preparation and preservation, nutrition and diet, clothing and dress, clubs work on many projects for community betterment. In 1954 there were more than 65,400 clubs with an enrollment of more than 1,520,900 women. Movement is spreading to urban areas. *See also in Index* Federal Extension Service
Home economics H-409–15, *pictures* H-410, 410*b*, 412–13, *Reference-Outline* H-413–14. *See also in Index* chief subjects below
air conditioning A-77–8
baby care B-2–4, *picture* B-2, *table* B-3
bibliography H-414–15: hobbies H-397–8
budget H-410
camping problems C-56–63
canning industry F-219–22
child care H-410–410*a*
child development C-239–48, *pictures* C-239–43, 245–8
clothing H-410, C-353–7, G-22–5, *pictures* C-353–6*f*, G-22–5, *Reference-Outline* C-357: fabrics F-4–9, *pictures* F-7–9, *color picture* F-5
color harmony in clothing, furnishings, decorations C-394–5
cooking C-463–6, *pictures* C-463, 465: bread and baking B-294–8, *pictures* B-294–7
dress D-148–51
energy, expenditure of, *chart* H-412, *pictures* H-412
entertaining guests E-406–7: being a guest E-407–8; private and school parties E-408
etiquette E-404–11, *pictures* E-407–9: conversation C-458–61; letter writing L-171–4
family F-16–20, *pictures* F-16–19: marriage M-100–1*b*, *pictures* M-100–1*a*
first aid F-94–8, *pictures* F-94–8
food F-210–18, H-302–4, *maps* F-213–14, *pictures* F-210–12, 215–16: economical buying and menu planning H-410*b*; pure-food laws P-442–3
furniture F-317–20, *pictures* F-317–20
heating and ventilating H-321–6, *pictures* H-321–5
home demonstration agent aids farm wives F-32
home management H-410*a*–13, *pictures* H-410*b*, 412–13, *Reference-Outline* H-413–14
hygiene H-304–5
interior decoration I-176–85, *pictures* I-176–7, 179–85, *table* I-178
kitchen equipment C-466, B-346*a*, *pictures* C-465, S-144*d*
lamps and lighting L-88–90, L-238–9, *pictures* L-89–90, L-239
laundry and dry cleaning L-135–6, *pictures* L-135–6
library for children at home L-207–10: list of books for L-210–17
nursing, home H-410*a*
radio talks H-410*a*
rugs and carpets R-247–52, *pictures* R-247–8, 250–1, *color picture* R-249
rural 4-H Club projects F-252, 252*a*, *pictures* F-252*b*
safety S-7–8, *picture* S-9: fire prevention F-89–91
sewing S-110–15, *pictures* S-110–15
shelter S-142–6, *pictures* S-142–5: house planning B-346–7
spot and stain removal H-411
table setting and serving E-408–9, *picture* E-407
thrift T-125–6
Home Economics, Bureau of Human Nutrition and, U.S. H-409, U-364, *picture* U-365
Home life. *See also in Index* names of countries, *subhead* people
American Colonies A-193*c*–7, 201–2, 208, 211–12
automobile, influence of A-501
baby care B-2–4, *picture* B-2, *table* B-3
budget, household H-410
building homes B-345–8, *pictures* B-346*a*–7
child development C-239–48, *pictures* C-239–43, 245–8
child's own library L-207–10: list of books L-210–17
citizenship training C-319–319*a*, *pictures* C-318, 319*a*
clothing C-353–7, *pictures* C-353–6*f*, *Reference-Outline* C-357: dressing to suit personality D-148–51, *pictures* D-148–51
cooking C-463–6, *pictures* C-463, 465
conversation C-458–61
education of children E-238–41, *pictures* E-238, 240
electric appliances E-313
etiquette E-404–10, *pictures* E-407–9
family F-16–20, *pictures* F-16–19
family relationships F-16–18, H-410*a*, *pictures* F-16–19
adolescence and its problems A-22–22*b*, *pictures* A-22–22*b*
baby affected by B-2
class in, *picture* E-252
factor in child training C-243–4, 248
influence on learning to read R-82–82*c*
sharing of books R-84*b*–*c*
farm life F-21–33, *pictures* F-21–33, *color pictures* F-24*a*–*b*
fire prevention F-89–91, S-7, 8, *pictures* F-89–90, S-9
first aid F-94–8, *pictures* F-94–8
food F-210–18, *maps* F-213–14, *pictures* F-210–12, 215–16
furniture F-317–20, *pictures* F-317–20
games G-8–8*f*, *pictures* G-8*a*–*f*
gardens and gardening. *See in Index* Gardens and gardening
health H-300–7, *pictures* H-300–1, 307
heating and ventilating H-321–6, *pictures* H-321–5: stoves S-424
hobbies, list of books H-388–401
home economics and home management H-409–15, *pictures* H-410, 410*b*, 412–13, *Reference-Outline* H-413–14
housing H-430–3, *pictures* H-430–2*a*, 432*c*–*d*, 432*f*–3, *table* H-432*b*. *See also in Index* Shelter
insurance I-166–70, *pictures* I-166, 168*a*, 169
interior decoration I-176–86, *pictures* I-176–7, 179–85, *table* I-178
leisure L-158–61, *pictures* L-159–60
lighting L-238, I-184–5, B-346*b*
Middle Ages C-134, *picture* C-133. *See also in Index* Middle Ages
modern city U-387
nursing: home nursing H-411; visiting nurse, *picture* H-307
pets and their care P-182–6, *pictures* P-182–6
pioneer life P-263–4
play P-315–20, *pictures* P-315–20
reading R-82*d*–4*f*
safety S-7–12
sewing S-110–15, *pictures* S-110–15
sociology S-221
thrift T-125–6, *picture* T-125
trailer living A-529, F-18*b*, *pictures* F-18*b*, S-144*d*
vacation activities V-421–32, *pictures* V-421–31, *Reference-Outline* V-424–32
water supply and waterworks W-71–4, *pictures* W-71–3
Home Loan Bank Board (HLBB), U.S. U-368
Home management H-410*a*–13, *pictures* H-410*b*, 412–13, *Reference-Outline* H-413–14. *See also in Index* Home economics
Home nursing H-410*a*
Homeop'athy, a system of medicine founded by Samuel C. F. Hahnemann; treats disease by administering drugs which excite in normal persons symptoms similar to those of disease treated ("likes are cured by likes").
Home Owners' Loan Corporation (HOLC), U.S. R-205
Ho'mer, ancient Greek poet H-415, G-209, *picture* H-415
life of early Greeks pictured G-196
translations H-415: for children L-273; Pope's P-369
words used E-374
Homer, Louise (1872–1947), dramatic contralto singer, born Pittsburgh, Pa.; married Sidney Homer, composer; distinguished by a voice remarkably even in quality over a great compass; notable roles, Amneris in 'Aïda'; Laura in 'La Gioconda'; Ortrud in 'Lohengrin'.
Homer, Winslow (1836–1910), American artist H-415–16, *picture* H-415
'Breezing Up' P-32, *color picture* P-32
'The Gulf Stream', *picture* H-415

Homer A Reading from by Alma Tadema *picture* T 190
Homer *See in Index* Homing pigeon
Home rule
Ireland I 230b Belfast opposes B 108 Gladstone's measures G 119 O'Connell's work O 337 Parnell supports P 91
Homes *See in Index* Building Housing Shelter
Homespun coarse loosely woven fabric formerly made in homes on hand looms from handspun yarn now imitated in factories
Homestake Mine large gold mine in W South Dakota S 305 S 308
Homestead Pa. important steel manufacturing borough 5 mi. s.e. of Pittsburgh pop 10 046 scene of notable strike in 1892 *map inset* P 132
Homestead National Monument of America in Nebraska N 36 *map* N 18
Homesteads
Alaska A 134
Alberta A 144
laws U S L 92 P 270 first bill J 358 L 92 immigration encouraged by I 46
Home Sweet Home song from opera Clari or the Maid of Milan by John Howard Payne first produced 1823 music adapted from Sicilian air by Sir Henry Bishop
Homewood Ala. city 3 mi. s.e. of Birmingham chiefly residential pop 12 866 *map* A 126
Homework Industrial I 129 30 E 363 S 460 *picture* E 369a
Japan J 301
New Brunswick N 138a
Switzerland S 476
Homily name applied to a didactic religious or ethical discourse
Homing pigeon or **homer** P 254 *picture* I 205
Homing projectile *See in Index* Guided missile
Hominy C 484
Indian dish I 100 1
pioneers use P 263
Homo generic name for man M 76
Homogenized (*hō mŏj ĕ-nīzd*) *milk* M 250d *table* M 252
Homo heidelbergensis the Heidelberg man M 70
Homo neanderthalensis the Neanderthal man M 70
Homonym name given to words different in meaning but similar in sound or spelling or both as pair pare pear
Homophones words sounded alike but spelled differently S 335
Homopolar bonds *See in Index* Covalent bonds
Homoptera order of insects *See in Index* Hemiptera
Homo sapiens human species to which modern man belongs M 70
Homs (*hōms*) Ancient Emesa, Syria historic city between Damascus and Hama pop about 100 000 S 488 *maps* A 285 I 224
Honan (*hŏ nan'*) inland province of e central China 66 693 sq mi pop 28 473 0 5 along Hwang (Yellow) River land level and fertile and heavily populated cap Kaifeng cereals cotton tobacco indigo hemp copal iron *center of* early Chinese culture *map* C 280
Hondo Island Japan *See in Index* Honshu
Honduras (*hŏn dŏo'ras*) republic of Central America 59 161 sq mi pop 1 505 460 cap Tegucigalpa H 416–17 *maps* C 172 N 251 *pictures* H 417 *See also in Index* Central America
agriculture H 416–17
banana plantation *pictures* H 417 C 175
climate H 416
education H 417
flag F 138 *color picture* F 136
government H 417
history H 417
industries H 416 417
jungle *picture* C 173
literature L 127–8
Mayan civilization I 110
people H 416 how the people live H 416 17
products H 416–17 mahogany *picture* C 175
relationships in continent *maps* N 245–6 248 250–1 258
transportation H 416 417
Honduras, British *See in Index* British Honduras
Honduras, Gulf of inlet of Caribbean Sea on e coast of Central America *map* C 172 *See also in Index* Ocean *table*
Honegger, Arthur (born 1892) French composer born Havre of Swiss *parents leader of young French* composers known as The Six first success was Pacific 231 musical impressions of locomotive for orchestra (Judith opera King David oratorio Antigone lyric drama)
Honesty plant *See in Index* Lunaria
Honey B 96 94 *picture* B 98
ancient use B 98
buckwheat B 338
clover C 359 360
color and flavor B 96 B 338
extracting from comb *picture* B 98
invert sugar S 447
poisonous from laurel L 137
producing regions B 96
Honey ant A 256 257
Honey badger *See in Index* Ratel
Honey bear *See in Index* Kinkajou
Honeybee B 93–6 W 52 *color picture* W 51 *See also in Index* Bee
Honeycomb a sponge S 355
Honeycomb waxy many celled structure made by bees for holding honey B 93 94 *pictures* B 98
Honeydew secreted by aphids A 273
Honeydew melon M 168
Honey locust a thorny tree of the legume family L 294
used in hedges H 329
Honey mesquite M 175 *picture* M 175
Honeymoon origin M 101a
Honeysuckle various shrubs bearing fragrant trumpet shaped flowers H 418 *picture* H 418
Japanese honeysuckle *picture* H 418 *color picture* F 177
wild honeysuckle or azalea A 542 *picture* A 542
Honeysuckle family or **Caprifoliaceae** (*kap ri fo li ā sē ē*) a family of plants and shrubs native to north temperate regions and mountains of the tropics including cranberry tree snowball bush the elders twinflower honeysuckles and weigelas
Hong Kong China British colony including island city pop 2 250 000 H 418–19 *maps* C 269 A 407 *picture* H 418
cable connections C 5
harbor *picture* H 262
Honi soit qui mal y pense D 43
Honiton pillow lace L 78
Honolulu (*hŏ nō lōō'lōō*) capital of Hawaiian Islands on s.e. shore of island of Oahu pop 248 034 H 287 *maps H 286 A 531* P 17 *picture* H 285
cemetery U S national N 16b
harbor in 1882 *picture* H 290
temperature average *H 287*
Honor decorations of D 38 40 *picture* D 39 *color picture* D 41 *See also in Index* Decorations of honor
Honor Legion of French order of merit reward for civil and military services D 40
Honor titles of *See in Index* Titles of nobility
Honorable title D 42
Honoraria *See in Index* Law *table of legal terms*
Honorary distinctions of universities and learned societies D 43
Honorius Flavius (384 423) Roman emperor of the West son of Theodosius A 129
ends gladiatorial contest G 116
Honors courses in colleges U 403
Honshu (*hŏn shōō'*) formerly **Hondo** largest island of Japan 88 903 sq mi pop 62 586 916 J 295 *maps* J 297 A 406
climate J 296
national park N 39
size comparative *See in Index* Islands *table*
Hooch or **Hoogh** (*hōH*) **Pieter de** (1629–78?) Dutch artist born Rotterdam best known as a genre painter his interiors are illuminated with splashes of daylight or sunlight of varied intensities
Hood, John Bell (1831 79) Confederate Civil War general born Owingsville Ky commanded divisions at Gettysburg and Chickamauga commander of Army of the Tennessee succeeding Johnston C 336
defeat at Nashville T 121
Hood, Raymond Mathewson (1881–1934) architect born Pawtucket R I with John Mead Howells designed Tribune Tower Chicago 1922 his New York City firm aided in Rockefeller Center development
Hood, Robin *See in Index* Robin Hood
Hood, Samuel, Viscount (1724–1816) English naval commander in chief in America 1767–71 distinguished in battles 1780–83 with French fleet under De Grasse in Mediterranean *1793 great tactician*
Hood, Thomas (1799 1845) English poet and humorist born London fame rests on his serious poems (The Song of the Shirt The Bridge of Sighs Miss Kilmansegg and The Plea of the Midsummer Fairies)
Hood, Mount highest point in Oregon (11 245 ft) in Cascade Range in n part of state 45 mi s.e. of Portland P 377 *maps* O 408 417 U 307 *pictures* O 407 P 376
volcanic nature L 138
Hood College at Frederick Md Evangelical and Reformed church for women founded *1893* arts and sciences home economics nursing
Hooded basilisk or **helmeted basilisk** a lizard L 284 I 25
Hooded oriole bird and nest *O 425 color picture* B 189
Hooded seal S 90
Hoodoo a person or *thing whose* presence causes bad luck
Hoof horny sheath encasing toes of many animals corresponds to finger nail or toe nail of man *See also in Index* Ungulates
horse H 428i E 451 F 224 H 255 *pictures* H 428a F 225
Hoof and mouth disease *See in Index* Foot and mouth disease
Hooft (*hōft*) **Pieter Cornelieszoon** (1581 1641) Dutch poet, historian and dramatist born Amsterdam studied law and history at Leyden translated Tacitus into Dutch and followed his style as historian founded circle of intellectuals including poet Sir Constantijn Huygens (prose works Henry IV of

France', 'Dutch History'; poetry: 'Minneliederen', 'Baeto').
Hoogh, Pieter de. *See in Index* Hooch, Pieter de
Hooghly, or Hugli (*hoog'li*), the westernmost channel in Ganges delta G-10, *map* I-54
Howrah Bridge B-308, *picture* C-20. *See also in Index* Bridge *table*
Hook, in boxing B-269, *pictures* B-267, 269
Hook cast, in fishing, list F-118*h*
Hooke, Robert (1635–1703) English physicist, born Isle of Wight, made curator of experiments to the Royal Society 1662, and secretary 1677–82; first scientist to recognize principle of planetary motion work furnished basis for Newton's theories
law of elastic displacement W-85–6
watch spring, first to use W-56
Hooker, Joseph (1814–79) (Fighting Joe), Civil War general, born Hadley, Mass.; commanded Army of Potomac (1863) succeeding Burnside; resigned command after losing battle of Chancellorsville later commanded victorious Army of Cumberland at "Battle above the Clouds": C-299, C-335
Hooker, Sir Joseph Dalton (1817–1911), English surgeon and naturalist; made important additions to botanical knowledge, expeditions to Antarctic regions Australia, the Himalayas, and Syria, with George Bentham, wrote 'Genera Plantarum'; friend of Darwin.
Hooker, Richard (1554?–1600), English author, wrote 'Laws of Ecclesiastical Polity', a masterly exposition of philosophical and political principles, it has been called the earliest English prose work "with enough of the preserving salt of excellence to adapt it to the mental palate of modern readers"
Hooker, Thomas (1586–1647), Puritan clergyman, born England; helped form (1643) New England Confederation: A-207–8
in Connecticut C-449, M-137
Hooker, Mount, Canada, peak near boundary of British Columbia and Alberta; elevation 10,782 ft.
Hook of Holland (Dutch **Hoek van Holland**), point of land at mouth of Maas (Meuse) River, 18 mi. from Rotterdam, *map* B-111
Hook shank, of fishhook, *list* F-118*h*
Hookworm, intestinal parasite H-419, W-303
Hoonah, Alaska, village on Chichagof Island, in s.e. Alaska, 50 mi. s.w. of Juneau; pop. 563; U.S. government school for natives; fish canneries; sawmill: *map* A-135
Hoop ash. *See in Index* Black ash
Hooper, John (1495?–1555), English martyr, bishop, and religious reformer; burned as heretic in reign of Mary I.
Hooper, William (1742–90), signer of Declaration of Independence; born Boston, Mass.; North Carolina's delegate to Continental Congress (1774–77)
signature reproduced D-37
Hoo'poe, any bird of the genus *Upupa*, native to warmer regions of Old World; common European hoopoe about size of bluejay; plumage black, white, and buff; long pointed bill; large erectile crest.
Hoop skirt D-147
Eugénie crinoline D-150–1
Hoop snake, a mythical reptile said to overtake victims by holding its tail in its mouth and rolling like a hoop; its tail said to have poisonous sting. Story common in s.e. U. S.
Hoorn, or Horn, Philip de Montmorency, Count (1518–68), Flemish patriot B-334
Hoo'sac Range, a spur of the Green Mountains in n.w. Massachusetts (Spruce Hill, 2588 ft.), *map* M-124
Hoosac Tunnel, in n.w Mass., through Hoosac Range to North Adams T-209, *map* M-132
Hoosic River, 90 mi. long, rises in n.w Massachusetts, flows n.w. across s.w Vermont into New York emptying into Hudson River, *maps* M-132, V-457
'Hoosier Schoolmaster, The', novel of Middle West pioneers by Edward Eggleston A-229
Hoosier State, popular name for Indiana I-73
Hooton, Earnest Albert (1887–1954), anthropologist, born Clemansville, Wis., began teaching anthropology at Harvard University 1913 professor 1930–54 and curator of Peabody Museum 1914–54 ('Up from the Ape' 'Why Men Behave Like Apes and Vice Versa')
Hoover, Herbert Clark (born 1874), 31st president of United States H-419–24, *picture* H-419
administration (1929–33) H-420, 421–4, U-387–8
agricultural policy H-421–2
arbitration Tacna-Arica A-294
economic conditions depression H-422–4; progress H-421
efficiency in government, activities H-421
Federal Farm Board H-422, F-20
foreign policy H-421
Hawley-Smoot tariff H-420, 423
lame duck amendment H-421
London Naval Conference and Treaty H-421, P-102, *picture* H-423
moratorium W-243, H-421, 423
Reconstruction Finance Corporation H-423
relief measures H-423
Roosevelt and R-204
speech at Harding's tomb H-268
Young Plan W-242, 244, *picture* W-243
ancestry and early life H-419–20
Belgian relief work H-420
characteristics, business and political H-423
defeat in 1932 election H-424, R-203
election to presidency H-421
Famine Emergency Committee (1946) H-424
food administrator (1917) H-420
mining engineer H-419–20
secretary of commerce H-421
wife W-129, H-420
Hoover, J. Edgar (born 1895), lawyer and criminologist, born Washington, D.C.; special assistant to attorney general 1919–21; assistant director, Federal Bureau of Investigation 1921–24, director after 1924; raised standards of bureau and founded laboratories for crime detection.
Hoover, Lou Henry (1875–1944), wife of President Hoover W-129, H-420
Hoover Dam, formerly **Boulder Dam,** in Arizona and Nevada, on Colorado River D-6–7, 11–11*b*, C-415, *diagram* D-11*a*, *maps* A-352, N-133, C-414*b*, *pictures* D-10–11, C-414*a*. *See also in Index* Dam, *table*
Lake Mead National Recreation Area N-38*d*, C-414*b*–15, *maps* N-18, C-414*b*, *picture* C-414*a*
size compared with other structures, *diagram* D-11*b*
Hooverize, World War I H-420
Hoover Library on War, Revolution, and Peace H-424
Hop, a plant. *See in Index* Hops
Hop, Japanese, an ornamental twining herb (*Humulus japonicus*) of the mulberry family, usually with pretty 5-lobed leaves splashed and streaked with white; hardy annual.
Hopalong Cassidy. *See in Index* Boyd, William
Hopatcong (*hō-păt'kŏng*), Lake, in New Jersey, 24 mi. w. of Paterson; about 8 miles long; popular summer resort: *map* N-164
Hop clover, *picture* S-133
Hope, Anthony, pen name of Sir Anthony Hope Hawkins (1863–1933), English novelist; 'The Prisoner of Zenda' and 'Rupert of Hentzau' set fashion for romantic comedies involving noblemen of fictitious principalities; later works deal with social and ethical problems
Hope, Bob, real name Leslie Townes Hope (born 1903) actor, radio and television entertainer, born London; to U.S. 1907, on stage from 1927 ('Roberta', 'Ziegfeld Follies'; 'Red, Hot and Blue') in radio from 1935; entered motion pictures 1938 ('Thanks for the Memory'; 'The Road to Zanzibar'; 'Paleface'); author 'I Never Left Home'.
Hope, or Hope Blue, 45½-carat diamond of pronounced blue color, named for Henry T. Hope, London banker, who acquired it in the 1830's purchased in 1911 by Edward B. McLean of Washington, D.C. This diamond is believed to be part of a large Indian stone which Tavernier sold to French Crown in 1668: *picture* D-79
Hope College, at Holland, Mich.; Reformed Church in America; founded 1866, arts and sciences, business administration, economics, music
Hopeh, or Hopei (*hō'pā'*), formerly **Chihli (*chĕ'lē'*),** province of n.e. China; about 55,000 sq. mi.; pop. 28,529,089; important cities Peiping and Tientsin; millet, wheat, sorghum, maize, coal, iron ore: *map* C-260
Hopewell, Va., industrial city at confluence of Appomattox and James rivers 20 mi. s.e. of Richmond; pop. 10,219; nitrates, rayon, paper, wood pulp and pulp board; purified cotton linters: *map* V-487
Hopewell culture, of prehistoric North American Indians I-109, M-438–9
relics, *picture* I-108*e*
Hopewell Village National Historic Site, near Reading, Pa. N-20
Hophornbeam, a genus (*Ostrya*) of slender trees with very hard wood, brownish furrowed bark; often planted as ornamental tree.
Hopi (*hō'pē*), tribe of Pueblo Indians living in Arizona P-431, A-346, *table* I-108
customs A-357
doll, *picture* A-357
pueblo, *picture* A-355; Walpi, *picture* I-92
snake dance, *color picture* I-106
Hopkins, Arthur (1878–1950), play producer, born Cleveland, Ohio; plays produced include 'Anna Christie', 'The Beggar's Opera', 'What Price Glory', 'The Petrified Forest'.
Hopkins, B. Smith (1873–1952), chemist, born Owosso, Mich.; professor of chemistry, University of Illinois 1923–41; with colleagues discovered illinium; early researcher on the rare earths.
Hopkins, Ernest Martin (born 1877), educator, born Dunbarton, N.H.; organized industrial concerns 1910–16; president Dartmouth College 1916–45.
Hopkins, Esek (1718–1802), first commander of American Navy, born Scituate, R.I.; captured British fort and naval station on island of

New Providence Bahamas 1776 dismissed for later failures N 91
Navy Jack first F 150a color picture F 128

Hopkins Sir Frederick Gowland (1861–1947) English biochemist professor at Cambridge University after 1914 Nobel prize 1929 work on vitamins V 497

Hopkins Gerard Manly (1844–89) English poet converted to Roman Catholic faith ordained a priest 1877 poems show originality of words and rhythm (*Wreck of the Deutschland* Inscape Beauty) L 380b

Hopkins Harry L (1890 1946) public official born Sioux City Iowa federal emergency relief administrator 1933 works progress administrator 1935 U S secretary of commerce 1938–40 special adviser to F D Roosevelt after 1940 administrator of lend lease program resigned 1945

Hopkins Johns (1795–1873) financier and philanthropist born on farm in Maryland merchant and leading financier in Baltimore founded Johns Hopkins University and Johns Hopkins Hospital in Baltimore

Hopkins Mark (1802 87) educator and author born Stockbridge Mass president Williams College 1836–72 stressed the development of the individual student
Garfield praises G 20
Hall of Fame *table* H 249

Hopkins Oceanus son of Steven Hopkins a Mayflower pilgrim born at sea M 146

Hopkins Stephen (1707–85) signer of Declaration of Independence born Providence R I governor of Rhode Island 1755–68
signature *reproduced* D-37

Hopkinson Francis (1737 91) American jurist and poet one of signers of Declaration of Independence admiralty judge of Pennsylvania 1779 89 then U S district judge
signature reproduced D 37
song writer M 466

Hopkinson Joseph (1770–1842) American jurist son of Francis Hopkinson
author of Hail Columbia N 40

Hopkinsville Ky city 60 mi nw of Nashville Tenn pop 12 526 tobacco market flour mills agricultural coal and timber interests Bethel College *map* K 30

Hop o My Thumb a fairy hero of several nursery stories

Hoppe (*hŏp ĕ*) Willie (William Frederick Hoppe) (born 1887) billiard player born Cornwall on the Hudson N Y began career as child held 51 world titles first 1906 (18 1 balk line) last 1952 (three cushion) retired from tournament competition 1952 continued in exhibitions *author of* Billiards As It Should Be Played *picture* B 144

Hopper Edward (born 1882) painter and etcher born Nyack N Y important in American scene painting (small town scenes railway tracks and trains old houses) naturalistic highly simplified work
The Lonely House *picture* A 4000

Hopper (William) De Wolf (1858–1935) American actor starred in Gilbert and Sullivan operas especially The Mikado, Patience H M S Pinafore

Hopper car a railroad car *picture* R 69

Hoppner John (1758–1810) English portrait painter rival of Sir Thomas Lawrence (Nelson)

Hops climbing herbs whose fruits are used in brewing beer H 424
harvesting *picture* W 47

Hop sacking a coarse *fabric of jute* and hemp made into sacks for hops also a rough loosely woven fabric of cotton rayon linen or wool

Hopscotch old English children's game player hops from one division to another of a diagram marked or scotched upon the ground kicking a stone or tile with the foot on which he hops

Hoquiam Wash port on Grays Harbor 80 mi s w of Tacoma pop 11 104 lumbering and fishing shipping interests *maps* W 44 U 252

Horace (Quintus Horatius Flaccus) (*hŏ răs ĕ*) (65 B C) Latin lyric poet L-131 *picture* R 181
son of a freedman S 196
Horae See Index Hours

Horatii (*hŏ rā shĭ ī*) three legendary Roman heroes R 181

Horatio (*hŏ rā shĭ ō*) in Shakespeare's Hamlet devoted friend of Hamlet

Horatius Cocles (*hŏ kl̆ē*) *legendary* Roman hero M 3–4 *color picture* M 3

Horehound or **hoarhound** bitter aromatic perennial herbs comprising the genus *Marrubium* of the *mint* family the common or white horehound (*Marrubium vulgare*) found in most regions of Europe and in the U S is a bushy perennial 1 to 1½ ft high with roundish wrinkled leaves covered with white down and whorls of small white flowers it is used as an infusion with sugar for coughs also in the making of a candy

Horgan Stephen Henry (1854–1941) inventor of halftone engraving process born near Norfolk Va first halftone was made for *New York Daily Graphic* March 4 1880

Horizon (*hŏ rī zŏn*) circular line formed by apparent meeting of earth or sea and sky astronomy circle formed by plane passing through center of the earth perpendicular to line of gravity produced *to meet the heavens*

Horizon artificial
navigation device in aviation A 92, N 77

Horizon Club C 54 55

Horizon line in picture P 160 *picture* P 160

Horizontal stabilizer in airplane A 89 *diagrams* A 87 96

Horizontal thrusts M 360

Horizontal union in labor L 71

Hormones (*hôr mōnz*) secretions of ductless glands H 424–6 B 146 *diagram* H 425
disease and D 104–5 diabetes B 53
fish F 104
regulate digestion P 245 D 91a
use as drugs D 158

Hormones plant L 224b P 306

Hormuz or ***Ormuz*** *small barren island* of s e Iran in Strait of Hormuz at entrance to Persian *Gulf in Middle Ages seat of trade* between Persia and India

Hormuz *Strait of See in Index* Ormuz Strait of

Horn Gunnar (born 1894) Norwegian Arctic explorer in 1930 discovered remains of Andrée expedition *finds photographs picture* P 351

Horn or **Hoorn Philip de Montmorency Count** (1518–68) Flemish patriot P 334

Horn Cape most southerly point of South America on Horn Island in Wollaston group s Tierra del Fuego *Archipelago* part of Chile *maps* C 250 S 203 256 *picture* S-272
early trade route S 161

Horn musical H 426–7 *picture* H 427
bugle B 342
sacred ram's horn *picture* J 354

Horn of animals H 426 *See also in Index* Antler
commercial uses H 426
distinguished from antlers H 426
shedding A 262 H 426

Hornaday William Temple (1854–1937) zoologist born Plainfield Ind director of New York Zoological Park 1896 1926 introduced legislation to protect and increase wild life William T Hornaday Memorial Foundation incorporated 1944 established children's natural history museums throughout U S (American Natural History Thirty Years War for Wild Life)
bison B 193

Hornbeam a genus (*Carpinus*) of trees of birch family with hard *tough wood and smooth* gray bark also called American hornbeam *Ironwood blue beech* and water beech

Hornbill a tropical bird H 427

Hornblende a black or greenish black mineral containing chiefly iron calcium magnesia and alumina found in crystals and granular masses a common constituent of *granite* and other igneous rocks M 966 R 169

Hornbook primer used in English as late as time of George II consisted usually of single leaf with alphabet in large and small letters Lord's Prayer and Roman numerals set in wood frame and protected by transparent horn *picture* E 241

Horn Book magazine L 270

Hornby C H St John (1867–1946) *English* bookseller and amateur printer educated at Oxford and called to the bar printed privately (Ashendene Press) small editions of beautiful books Dante (in folio) *and Morte d'Arthur are among* masterpieces of modern printing

Horne Henry Sinclair Horne first Baron (1861 1929) British general went to Near East with Kitchener in 1914 commander of First Army 1916 rank of full general 1919 and made baron

Horne Sir Robert Stevenson (1871–1940) British political leader minister of labor and presiding officer National Industrial Conference 1919 president of Board of Trade 1920 chancellor of exchequer 1921–22

Horned dace or **creek chub** D 1

Horned grebe G 187

Horned horse *See in Index* Gnu

Horned lark L-103 *color picture* B 186
courtship flights B 171
nest *picture* L 103

Horned owl O 431 *pictures* O 431, B 159

Horned pheasant or **tragopan** a brilliant bird of the Himalayas has hornlike projection behind each eye *nests* in trees

Horned poppy *See in Index* Glaucium

Horned rattlesnake or **sidewinder** R 78

Horned toad a lizard L 283 *picture* N 53
protective coloration *picture* P 421

Horned viper V 477

Hornell N Y manufacturing city and trade center on Canisteo River 58 mi s of Rochester pop 15 049 silk silk printing and dyeing railroad shops *map* N 204

Hornet a social wasp H 423, W 43 *color picture* I 154d
classified W 53

Hornet Lawrence's ship L 140

Horney (*hôr'nī*), Karen (1885–1952), American psychoanalyst, born Germany of Norwegian father and Dutch mother, came to U S 1932, became citizen 1938; in 1941 she helped found American Institute for Psychoanalysis, New York City, dean 1941–52; author of 'Self-Analysis', 'Our Inner Conflicts', and 'Neurosis and Human Growth': P-425

Hornfels, rock R-170

Hornpipe, musical instrument of Celtic origin, consisting of wooden pipe with reed mouthpiece, in modern usage a lively dance accompanied by a tune (hornpipe) in duple time, distinctively a sailor's dance

Hornwort, an herb (*Ceratophyllum demersum*) of the family *Ceratophyllaceae*, growing under water, leaves divided into three threadlike rigid parts resembling a horn, used in aquariums *color picture* P-286

Horny sponge, *picture* S-353

Horology, science of measuring time *See in Index* Clocks, Watches

Horowitz (*hôr'ō-vits*), Vladimir (born 1904), Russian pianist born Kiev, brilliant technique and flawless execution, debut in United States 1928, married daughter of Arturo Toscanini.

Horrid helioderm, a poisonous lizard, *picture* L-283

Horrocks, Jeremiah (1617?–41), English astronomer, born near Liverpool; first to observe transit of Venus 1639; from these observations, computed the solar parallax, providing a basis for determining the dimensions of the solar system.

Horsa. *See in Index* Hengist and Horsa

Horse H-428–9, *pictures* H-428–428*d*, *f–j*, *table* H-428*e*
- Arabian H-428*a*, *table* H-428*e*
- armored steeds, *picture* A-376
- army, use in A-379
- bibliography H-391–2
- blacksmithing B-204*a*, *picture* B-204*a*
- breeding regions. Belgium B-110; France F-262; United States H-428*d*, K-23, 24, W-100, *picture* K-21
- breeds H-428*a–h*, *pictures* H-428*b–c*, A-62, *table* H-428*e*
- care and feeding H-428*d*, 428*j–9*
- circus horse, *picture* C-315
- color-type horses H-428*h*, *pictures* H-428*d*, *table* H-428*e*
- commercial products: cordovan leather L-150; hair H-243
- declining use of H-428*i*
- domestication of: beginnings H-428, C-327; earliest uses H-428, T-170*d*
- evolution H-428*i*, *pictures* H-428*i*, P-406*d*: foot and hoof H-428*i*, E-451, F-224, H-255
- fishing, use in, *pictures* O-409, U-306
- fossil tells geologic time, *picture* G-52
- gaits H-428*h*, *pictures* H-428*f–g*
- hair, *picture* H-243: uses H-243
- height, how measured H-428*a*
- horse shows H-428*h*
- humane society aids, *picture* H-443
- jumping, *pictures* M-432
- largest and smallest H-428*a–b*
- lassoing, *pictures* C-149, R-257
- length of life, average, *pictograph* A-249
- merry-go-round horses C-126, *picture* C-125
- Mongolian M-343
- mythology: Centaur C-170–1, *picture* C-170; Japanese M-353; Pegasus P-110–11
- parts of, *picture* H-428*a*
- portrayed in art: book illustration, *pictures* A-230*e*, C-202–4, E-376*a*, 380*b*, 382*b*, L-207, L-274–5, S-413; painting, *pictures* A-230*e*, F-268, R-119, R-129, *color pictures* C-531, F-42, *I-104c*, P-26, 28, 37*c*, Persian miniature *picture* P-157; pottery horses of Chinese P-394; sculpture, *pictures* E-444, G-206, I-281, P-280, S-78*c*, 82
- railroads for horse-drawn vehicles R-58, 59, I-132
- related species ass A-424–5; zebra Z-350, *picture* Z-350
- riding H-429: books about H-391–2; breeds and types of riding horses H-428*b*, *d*, *f*, *g–h*, *pictures* H-428*c–d*, *f–g*, *table* H-428*e*, saddle H-429, *pictures* H-428*j*, yearling's first rider H-428*j*
- teeth H-428–428*a*, *picture* T-34
- toy horse, ancient Greece, *picture* G-201
- training H-428*i–j*, cattle herding C-152–3, polo P-365, *picture* P-365
- wild horses H-428*d*

Horse ant, a wingless wasp W-53

Horseback riding. *See in Index* Horse, *subhead* riding

Horse bean, a tree *See in Index* Jerusalem thorn

Horsecar, a streetcar drawn by horses S-429–30, *picture* S-430

Horse chestnut B-338. *See also in Index* Buckeye
- leaves, *pictures* L-151–2
- twig *diagram* P-298

Horse chestnut family, or Hippocastanaceae (*hip-pō-kas-ta-nā'sē-ē*) a family of shrubs and trees native to the north temperate region, including the Ohio buckeye, yellow buckeye, California buckeye, common horse chestnut, red horse chestnut, woolly buckeye, dwarf horse chestnut or bottlebrush buckeye, and Japanese horse chestnut

Horse conch, a shell S-139*b*

Horse family, or Equidae (*ĕk'wi-dē*), a family of one-toed, hoofed animals with peculiarly ridged and hollowed teeth; includes horse, ass and zebra

Horsefly, a two-winged fly of the order *Diptera*, family *Tabanidae*; also called gadfly, usually about 3 times size of housefly; has pointed proboscis, only females suck blood; males sip plant sap or nectar: *color picture* I-154*d*

Horse Guards, Royal, England L-303, *map* L-301, *picture* L-305

Horsehair, *picture* H-243
- Spanish moss substitute A-111
- uses H-243

Horseheal. *See in Index* Elecampane

Horse latitudes, a zone of light winds between the trade wind and prevailing westerly zones W-153, *diagram* W-154

Horse leech L-158

Horse mackerel, name given to several members of the mackerel family, particularly to the Atlantic tuna (*Thunnus secundodorsalis*) and to the blue-finned tuna of the Pacific (*Thunnus thynnus*): T-205

Horsemen. *See in Index* Four Horsemen of the Apocalypse

Horsenettle, perennial plant (*Solanum carolinense*) of the nightshade family; native to North America; grows 1 to 4 ft., hairy, grayish with long yellow prickles; a common weed in waste places.

Horsens, Denmark, seaport on Fiord of Horsens, 32 mi. s.w. of Aarhus; pop. 35,893; iron products, ships, woodenware; exports butter and bacon: *map* E-424

Horse of Troy, story of T-191–2

Horsepower P-403

Horse racing H-428*b*, *d*
- course at Buenos Aires, *picture* B-340

Horse-radish C-1, 2

Horseshoe
- early horseshoe, *picture* I-248

Horseshoe Bend, in Tallapoosa River, 40 mi. n.e. of Montgomery, Ala.

Horseshoe Bend, battle of. *See in Index* Tallapoosa, battle of

Horseshoe crab, or king crab, a marine arthropod has horseshoe-shaped shell C-504, T-189, *picture* C-504
- scientific name C-505

Horseshoe Fall, the Canadian portion of Niagara Falls N-230, *map, inset* N-230, *picture* N-229, *picture map* N-231

Horseshoe nails N-2, *picture* N-1

Horseshoes, a game Q-14

Horses of St. Mark's, a famous bronze group above main entrance to St. Mark's Cathedral in Venice, *picture* I-281

Horse stinger. *See in Index* Dragonfly

Horsetail family, or Equisetaceae (*ĕk-wi-sē'ta-sē-ē*) a family of perennial plants of one genus, native to tropical and temperate regions including scouring rushes or horsetails

Horsetails, or scouring rushes P-289, F-52, 54, *picture* F-54
- spores S-355, F-54

Horsetails, clouds C-359

Horse wrangler, on western cattle *ranch* C-150

Horta, a city of the Azores capital of Fayal pop 8184 good harbor; fisheries exports whale oil, fruit, wine, grain A-542

Hortensian Law (*lex Hortensia*), in Roman history R-184

Horthy (*hôr'tē*) **de Nagybanya, Nicholas** (born 1868), Hungarian admiral; elected regent of Hungary 1920, overthrown Oct. 1944; suppressed attempts of former King Charles to regain throne: H-450

Horticulture, as vocation. *See in Index* Fruits and fruit growing; Gardens and gardening; Plants; Shrubs

Horton, England, Milton's home M-257

Horus (*hō'rŭs*), ancient Egyptian sky-god D-283–4
- falcon symbol of, *picture* E-278*b*
- temple, *picture* A-305

Horus, son of the Egyptian god Osiris O-426*a*

Horwich, Frances R(appaport) (born 1908), television star, educator, and writer, born Ottawa, Ohio; professor of education Roosevelt College, Chicago, Ill., 1946–52, also department chairman 1947–52, took leave of absence Oct. 1952 to star as Miss Frances on television nursery-school program, Ding Dong School; president National Association for Nursery Education 1948–51.

Hosain, or **Husein**, grandson of Mohammed. *See in Index* Hasan and Husein

Hose, a kind of legging S-397. *See also in Index* Stockings

Hose, garden
- jet principle explained J-340
- manufacture R-240

Hosea (*hō-zā'a*) (8th century B.C.), Hebrew minor prophet; wrote 28th book of Old Testament: P-418, J-352

Hosiery. *See in Index* Stockings

Hosmer, Harriet (1830–1908), sculptor, born Watertown, Mass.; a classicist; lived many years in Rome ('Puck'; 'The Sleeping Faun').

Hosoda Eishi. *See in Index* Eishi, Hosoda

Hospitalers (Order of the Hospital of St. John of Jerusalem). *See in Index* Knights Hospitalers of St John

Hospital insurance I-168*b*

Hospitals H 429–429b *pictures* H 429a–b
crusaders (Hospitalers) C 522–3
emergency service H 429a
Florence Nightingale N 236b 237
footprint identification F 69
history H 429b
nurses hospital duties H 429 429a
training N 314 H 433 *picture* N 315
standardization of beds U 368
U S Navy hospital ship *picture* N 315
Host in biology P 77–80
Hosta (*hos'tə*) or **plantain lily** formerly called funkia hardy perennial native to eastern Asia Grows in clumps leaves large with prominent ribs flowers in spikes white or lilac florets funnel shaped lives one day also called day lily
Hostage a person or thing given by one of two conflicting parties to the other or seized as a pledge for carrying out the conditions of a treaty
Hostels overnight accommodations for travelers especially student travelers Youth hostels established in Germany in 1909 in U S 1934 by the American Youth Hostels Inc with national headquarters at New York City about 250 youth hostels in U S conduct tours to Europe Canada Alaska South America and regional tours in U S members travel mainly by bicycle boat or on foot
England I 353
Hostilius (*hŏ stĭl' ĭ ŭs*) **Tullus** Roman king R 181
Hostos y Bonilla (*ŏs'tŏs ē bō nēl'yä*) **Eugenio María de** (1839–1903) Latin American writer L 114
Hot air furnace H 321–2 323 324
Hotbed in gardening G 13–14
Hotchkiss Benjamin B (1826–85) inventor born Waterbury Conn worked in gun factory in youth invented guns and projectiles famous for Hotchkiss machine gun
Hôtel de ville (*ō tĕl' dĕ vēl'*) French for town hall
Brussels B 334
Paris *map* P 83a
Hotien (*hō'tyĕn'*) also **Khotan** (*kō-tän'*) trade city in sw Sinkiang (Chinese Turkestan) pop about 134 000 cotton silk hides *map* A 406
Hot music in jazz slang the extreme form of swing music *See also in Index* Sweet music
Hot Springs also **Hot Springs National Park** Ark noted health resort in a valley of the Ozark Mts pop 29 307 Army and Navy General Hospital A 359–60 *map* A 366 *picture* A 370
national park A 359 N 19 35 *maps* N 18 A 366
Hot Springs S D health resort and tourist town 45 mi sw of Rapid City pop 5030 Bad Lands and Black Hills nearby *maps* S 302 U 252
Hot springs or **thermal springs** in physical geography S 257
Hot Springs National Park Arkansas A 359 N 19 35 *maps* A 366 N 18
Hotspur *See in Index* Percy Sir Henry
Hottentot one of a South African people A 43 S 242 *map* A 39
racial classification *chart* R 22
Hot water heating H 321 322 323 325
Hot wire ammeter G 6
Houdin (*ō dăn'*) **Robert** (1805–71) French conjurer and prestidigitator M 38
Houdini (*hō dē'nē*) **Harry** (originally Erich Weiss) (1874–1926) magician and writer born Appleton Wis famed not only for his own remarkable tricks but for exposing those of spiritualistic mediums and frauds (Paper Magic The Right Way to Do Wrong Pope Tells and Escapes) *picture* M 40
Houdon (*ō dôn'*) **Jean Antoine** (1741–1828) French sculptor
sculptures S 78d–9 Benjamin Franklin *picture* S 78d Washington R 153 *picture* W 19
Houdry (*hōō drē'*) **Eugene J** (born 1893) American inventor born Paris France came to U S 1930 became citizen 1942 associated with Sun Oil Company
petroleum refining P 178
Hough (*hŭf*) **Emerson** (1857–1923) journalist and novelist born New Boston Iowa educated for law but practiced little wrote realistic and historical novels of life in West (The Mississippi Bubble Fifty four Forty or Fight The Covered Wagon North of Thirty Six)
Houghton (*hō'tən*) **Alanson B** (1863–1941) diplomat born Cambridge Mass head Corning Glass Works ambassador to Germany 1922–25 to Great Britain 1925–29
Houghton Daniel V 461
Houghton Douglass (1809–45) geologist born Troy N Y professor at University of Michigan discovered mineral resources of Michigan drowned in Lake Superior at mouth of Eagle River Houghton Mich named for him M 280 291
Houghton Stanley (1881–1913) English critic and dramatist a leader in realistic movement (Hindle Wakes)
Houghton Mich village opposite Hancock on Lake Portage connected with Lake Superior by canal pop 3829 shipping point for Lake Superior copper region Michigan College of Mining and Technology *maps* U 253 *inset* M 226
Houghton College at Houghton N Y founded 1883 by Wesleyan Methodist church arts and sciences music theology
Houma La city 44 mi sw of New Orleans port on Intracoastal Waterway pop 11 505 gas and oil fields sulfur dome sugar cane raw furs shrimp center *map* L 331
Hound hunting dog D 110b *color pictures* D 114 *table* D 118–118a *See also in Index* hounds by name as Afghan hound
Hound's tongue *See in Index* Chinese forget me not
Hour divided into 60 minutes B 68
Hour angle in astronomy the angular distance between the meridian of an observer and the hour circle through a celestial body at a given time
Hour circles in astronomy A 439–40 *diagram* A 438
Hour glass or **sand glass** W 55 *picture* W 54
Houris (*hoo rēz'*) in Mohammedan religion beautiful maidens who minister to the faithful in Paradise
Hours or **Horae** (*hō'rē*) goddesses of law and order in mythology A 274
Hours of labor
agriculture effect of machinery *picture* A 61
China C 272
Japan J 307
shorter hours L 75 L 158 *chart* I 145 Van Buren's influence V 437
sweatshop system S 460
Housatonic River rises in Berkshires in w Massachusetts flows 150 mi through Connecticut to Long Island Sound *maps* C 438 444 M 132
House Edward M (1858–1938) political leader born Houston Tex confidential foreign agent of President Wilson member American Peace Commission 1919 W 234
Houseboat covered flat bottomed boat used as house or for cruising
Chinese life on C 116 C 264 A 416 *picture* C 264
House divided against itself cannot stand A This Biblical truth was expressed by Abraham Lincoln in accepting the Republican nomination to the U S Senate June 1858 He went on to say I believe this government cannot endure permanently half slave and half free I do not expect the Union to be dissolved—I do not expect the house to fall—but I do expect it will cease to be divided
House finch I 68
Housefly F 188–9 *pictures* F 188 9
bacteria spread by F 188
classification I 160a
eggs *picture* E 269
eye F 189 *picture* E 461
parasite of *picture* P 79
Household management H 410a–13 *pictures* H 410b 412 13 *Reference Outline* H 413 14 *See also in Index* Home economics
Household list a categorical classification C 136 *picture* C 136
Houseleek *See in Index* Live forever
House mouse *See in Index* Mouse
House of Burgesses *See in Index* Burgesses House of
House of Commons *See in Index* Commons House of
House of David *See in Index* David House of
House of Keys Isle of Man M 71
House of Lords *See in Index* Lords House of
House of Representatives *See in Index* Representatives House of
House of the Seven Gables The romance by Hawthorne H 294
house *picture* M 130
House raising P 285
Houses *See in Index* Architecture Housing Shelter
House snake *See in Index* Milk snake
House sparrow *See in Index* English sparrow
House wren W 305 *color picture* B 185
Housing H 430–3 *map* H 431c *pictures* H 430–2a c–d 432f–3 *table* H 432b *See also in Index* Shelter
adequate H 430a b B 345–6b
bibliography S 146
blighted areas H 431b *map* H 431c, *pictures* H 431c–2
building and loan association B 342
census of in U S C 159
city problems S 144d–5 C 323a–b
cost H 432c–d b *table* H 432b
government aid 432e–3
life expectancy of building H 432a
prefabricated houses B 346b H 432d *pictures* B 347 H 432a
private enterprise H 432b–e
public housing H 432e–3
Puerto Rico projects in P 433 *picture* P 493
slums H 430b–1b *pictures* H 431 431a U 312 China C 266 clearance B 345 H 432e–f T 200 *picture* P 208 Rome R 192
social studies include S 218c
Sweden H 433 S 463 *pictures* H 433 S 463
zoning and building regulations H 432c–d
Housing Administration Federal (FHA) U S R 205 U 368
Housing Administration Public U S U 368

Housing Agency, National (NHA), U.S. R-205
Housing and Home Finance Agency, U.S. U-368
Housing Authority, United States (USHA) B-345, *picture* R-208
Hous'man, Alfred Edward (1859–1936), English poet and scholar; professor of Latin, Cambridge; edited classical works; lyrical poems express exquisite sensitiveness to beauty and cruelty ('A Shropshire Lad'; 'Last Poems'): E-382*a–b*, L-98*b*
quoted E-382*b*, P-335
Housman, Laurence (born 1865), English writer and illustrator, brother of A. E. Housman; wrote children's stories ('What O'Clock Tales'), novels ('An Englishwoman's Love Letters'), plays ('Little Plays of St. Francis' and 'Victoria Regina'), reminiscences ('The Unexpected Years'), and poetry ('Green Arras' and 'Spikenard')
'Victoria Regina', *picture* D-135
Houssay, Bernardo A. (born 1887), Argentine physiologist and biologist, born Buenos Aires; professor of physiology, University of Buenos Aires 1919–46; for his research on frontal lobe of pituitary gland and its importance in distributing glycogen (animal starch) in the human body, he shared 1947 Nobel prize in medicine and physiology with Carl F. and Gerty T. Cori, who did research in related field.
Houston (*hūs'tŭn*), **Samuel** (1793–1863), American soldier and statesman, president of republic of Texas H-434, A-475, *picture* H-434
memorial day for (March 2) F-56
Statuary Hall. *See in Index* Statuary Hall (Texas), *table*
Houston, Tex., largest city of state, 50 mi. n.w of Galveston Bay; pop. 596,161: H-434–6, *maps* U-253, *inset* T-90, *pictures* T-80, H-435
museum. *See in Index* Museums, *table*
oil field machinery plant, *picture* T-93
presidential convention. *See in Index* Convention, *table*
Rice Institute, *picture* T-96
ship canal H-434, 435, *picture* H-435. *See also in Index* Canals, *table*
synthetic-rubber plants, *picture* R-245
Houyhnhnms (*whin'mz*), in 'Gulliver's Travels' G-229, S-470, *picture* G-229
Hova, tribe of Madagascar M-22
Hove, town in Sussex, England adjoining Brighton; pop. 69,435; forms part of famous Brighton promenade: *map* B-325
Hovenweep National Monument, in Utah and Colorado N-35, *map* N-18
Hovey, Richard (1864–1900), poet, born Normal, Ill. ('Launcelot and Guenevere'; with Bliss Carman, 'Songs from Vagabondia').
Howard, great English family, whose head is the duke of Norfolk, first duke and earl marshal of England, and whose branches hold many other peerages; rose to greatness and misfortune in Tudor reigns.
Howard, Bronson (1842–1908), dramatist, born Detroit, Mich. ('The Henrietta'; 'Shenandoah').
Howard, Catherine (1520?–42), 5th queen of Henry VIII of England beheaded H-338
Howard, John (1726–90), English philanthropist and prison reformer; remedied shocking abuses: P-416
Howard, John Eager (1752–1827), American Revolutionary War officer, born Baltimore County, Md.; fought at Germantown, Monmouth, Cowpens, Eutaw Springs; governor of Maryland 1789–92; much of land he owned now in city of Baltimore.
Howard, Leland Ossian (1857–1950), entomologist, born Rockford, Ill; chief, Bureau of Entomology, 1894–1927 ('Mosquitoes—How They Live'; 'The Insect Book'; 'The *House-Fly*—Disease Carrier'; 'Mosquitoes of North America').
Howard, Leslie (1893–1943), English actor, playwright, producer, born London; New York debut 1921; stage successes 'Her Cardboard Lover', 'Berkeley Square', 'Petrified Forest'; in motion pictures after 1930 ('Of Human Bondage', 'Petrified Forest', 'Pygmalion')
in 'Hamlet', *picture* T-113
Howard, Luke (1772–1864), English scientist; invented first generally accepted system of cloud nomenclature.
Howard, Oliver Otis (1830–1909), American Civil War general commissioner of Freedmen's Bureau 1866–72, instrumental in establishing Howard University for Negroes, its president 1869–73 founded Lincoln Memorial University for mountain whites at Cumberland Gap, Tenn
Howard, Sidney Coe (1891–1939), playwright, born Oakland Calif.; did journalistic work in New York; with Paul de Kruif wrote 'Yellow Jack', a play about the fight against yellow fever; plays are clever and of varying types ('They Knew What They Wanted', won Pulitzer prize 1925; 'The Silver Cord'; 'Half Gods').
Howard of Effingham, Charles Howard, 2d Baron (1536–1624), created earl of Nottingham 1596; English lord high admiral; influential with Queen Elizabeth I, his kinswoman
Spanish Armada A-373: flagship, *picture* E-372
Howard of Penrith, Esme William Howard, first Baron (1863–1939), English diplomat; served in Ireland, Italy, Crete, Hungary, Switzerland, Sweden, and Spain; ambassador to U.S. 1924–30.
Howard College, at Birmingham, Ala.; founded 1842 by Baptist church; arts and sciences.
Howard University, at Washington, D. C., for Negroes; founded 1867; liberal arts, dentistry, engineering and architecture, law, medicine, music, pharmacy, social work; graduate school.
How'dah, box for riding elephant E-327
Howe, Edgar Watson (1853–1937), author and editor, born Treaty, Ind.; editor *Atchison* (Kan.) *Daily Globe* 1877–1911; editor *E. W. Howe's Monthly* after 1911 ('The Story of a Country Town'; 'Plain People'): A-229
Howe, Elias (1819–67), inventor of the sewing machine H-436, S-117
Hall of Fame, *table* H-249
sewing machine H-436, *picture* H-436: patented, *table* I-199
Howe, Joseph (1804–73), Canadian statesman, journalist, orator, born Halifax, Nova Scotia; premier of Nova Scotia 1860–63, strong opponent of Confederation, but after it was secured accepted position 1867–73 in first cabinet: N-309
Tupper opposes T-210
Howe, Julia Ward (1819–1910), writer and reformer, born New York City; wife of Samuel Gridley Howe; vigorous leader in many philanthropic causes and pioneer in woman suffrage movement; first woman to be elected to American Academy of Arts and Letters (1908) ('Sex and Education'; 'Modern Society'; 'Margaret Fuller', biography), *picture* N-43
'Battle Hymn of the Republic' N-40
forms woman's club W-183
Howe, Richard, Earl (1726–99), English admiral; commanded British sea forces in American Revolution; relieved Gibraltar 1782; gained victory of "glorious first of June" 1794 over French off Ushant.
Howe, Samuel Gridley (1801–76), pioneer educator and reformer, born Boston, Mass.; founder and first superintendent of the Perkins Institution for the Blind; founder of the first school in the U.S. for idiots and the feeble-minded
teaches Laura Bridgman B-206
Howe, Sir William (1729–1814), British general, younger brother of Richard, Earl Howe; commander in chief of British land forces in North America 1775–78
battle of Long Island L-311
condemns Nathan Hale H-247
proposes peace, *picture* R-130
Revolutionary War R-128, 128*a*
Howe, William Henry (1846–1929), animal painter, born Ravenna, Ohio; known especially for his landscapes with cattle ('Return of the Herd'; 'Cattle at Rest').
Howe, Cape, at s.e. tip of Australia, *maps* A-489, 478
Howell, Clark (1863–1936), journalist, born Barnwell County, S.C.; succeeded Henry W. Grady as managing editor 1889 (editor in chief after 1897) of the *Atlanta Constitution*, which he maintained as one of leading papers of the South; served several terms in Georgia legislature; member of Democratic National Committee 1892–1924, 1936.
Howells, John Mead (born 1868), architect, born Cambridge, Mass.; son of William Dean Howells; designer of buildings for Columbia, Harvard, and Yale universities; in association with Raymond M. Hood designed Tribune Tower, Chicago.
Howells, William Dean (1837–1920), American novelist, essayist, and critic H-436, A-230*a*
quoted A-230*b*
Howitt, William (1792–1879), and **Mary** (1799–1888), English authors; husband and wife; wrote prose and verse in collaboration ('The Forest Minstrel'); also independently.
Howitzer, a piece of artillery firing at elevations higher than a field gun but lower than a mortar A-397, *pictures* W-231, A-381, A-397
Howland Island, a tiny sand and coral island in the Pacific, about 1900 mi. s.w. of Honolulu; colonized by the U. S. in 1935 as a way station for planes flying from the Hawaiian Islands to Australia; airport built there in 1937; pop. 4: *map* P-17
Howler monkey M-350, *picture* M-349
How'rah, suburb of Calcutta, India; pop. 433,630; jute, cotton, iron, and machinery manufactures: C-20–1, *maps* I-54, A-407
bridge B-308, *picture* C-20. *See also in Index* Bridge, *table*
Hoxie, Vinnie Ream (1847–1914), sculptor, born Madison, Wis.; commissioned by Congress to make statues of Lincoln and Sequoyah (in U. S. Capitol) and Farragut statue in Washington; first woman sculptor to receive a commission from U.S. government.
Hoy (Norse, "high island"), 2d in size (53 sq. mi.) of Orkney Islands O-425, *map* B-324

Hoyle Edmond (1672–1769) English author of rules of whist and other games, long regarded as authoritative so that according to Hoyle has become a proverbial phrase

Hradec Kralove (*hrä dĕts krä lō vĕ*) formerly **Königgrätz** (*kö nig grĕts*) city of Czechoslovakia in province of Bohemia 65 mi e of Prague pop 52 292 14th century cathedral varied manufactures Sadowa or Königgrätz battlefield (1866) in Austro Prussian War nearby *map* J 425
results of battle C 97

Hrdlicka (*hur dlĭ kä*) **Ales** (1869–1943) American anthropologist born in Bohemia authority on Indians curator U S National Museum founder *American Journal of Physical Anthropology*

Hrolf or **Rolf** *See in Index* Rollo

Hrozny (*hrōz nē*) **Friedrich Bedrich** (1879–1952) Czech orientalist placed Hittite language in Indo European group professor of cuneiform research and ancient oriental history at Charles University of Prague H 386

Hruodland Count or **Roland** hero of Charlemagne s army celebrated in medieval legend R 178 S 415 422

Hsia (*shyä*) **Dynasty** (about 2200 B C) China C 278

Hsingan (*shing dn*) Mongol region in w Manchuria incorporated 1949 into Inner Mongolian Autonomous Region *M 74*

Hsinking Manchuria *See in Index* Changchun

H Sophie Newcomb Memorial College for Women. *See in Index* Newcomb *College*

Hsuan T'ung *See in Index* Pu yi

Hsu Shih Chang (*shu shir chang*) (*1855–1939*) Chinese statesman elected 1918 president of Chinese republic resigned 1922

Huambo Angola *See in Index* Nova Lisboa

Huaraches (*hwä rä chĕs*) Mexican sandals M 197

Huarizo (*wa rē thō*) South American fur bearing hybrid animal a cross between a male llama and a female alpaca

Huasco Chile port about 360 mi s of Antofagasta pop 9000 C 252 *map* C 250

Huaso (*hwa sō*) Chilean cowboy *picture* C 255

Huaxtec or **Huastec** (*was tĕk*) a tribe in s Mexico along Gulf of Mexico said to be an offshoot of Mayans
carving *picture* I 109

Hub of wheel W 120

Hubay (*hō bī*) **Jeno** or **Eugen** (1858–1937) Hungarian violinist and composer born Budapest pupil of his father and of Joachim work includes operas (The Violin Maker of Cremona Anna Karenina) concertos symphonies *songs*

Hubbard Bernard Rosecrans (born 1888) Jesuit scientist and lecturer born San Francisco professor of geology University of Santa Clara Santa Clara *Calif.*, after 1926 noted for geological explorations in Alaska (Mush You Malemutes!)

Hubbard Elbert (1859–1915) writer born Bloomington Ill founded and edited *The Philistine* a magazine of protest *founded* Roycroft Shop East Aurora N Y (Little Journeys Message to Garcia)

Hubbard, Kin (Frank McKinney Hubbard) (1868 1930) caricaturist and humorous writer born Bellefontaine Ohio on *Indianapolis News* after 1891 (Abe *Martin s* Sayings)

Hubbard Leonidas Jr (1872 1903) American *journalist and explorer* with Dillon Wallace in 1903 journeyed 250 mi farther in Labrador interior than former white explorers died *from exposure*

Hubbard squash S 359

Hubble Edwin Powell (1889–1953) astronomer born Marshfield Mo at Mount Wilson Observatory after 1919 at Mount Wilson and Palomar observatories after 1948 (Realm of the Nebulae)

Huber (*u bĕr*) **François** (1750–1831) Swiss naturalist first to gain scientific knowledge of the life of bees

Huberman (*hu ber mdn*) **Bronislaw** (1882–1947) Polish violinist beginning 1892 had world wide success as virtuoso founded Palestine Symphony Orchestra 1935

Hubert (*hu bert*) **Saint** (died 727) apostle of the Ardennes and patron of huntsmen festival November 3

Hubertsburg or **Hubertusburg Peace** of signed 1763 in chateau of Hubertusburg in Saxony Germany ending Seven Years War S 107

Hubert Walter *See in Index* Walter Hubert

Hübnerite, a tungsten ore T 206

Hucbald or **Hubaldus** (about 840–930) Benedictine monk writer and musician born near Tournai wrote lives of saints best known for works on music considered pioneer in writing for several voice parts

Huch (*hoĸ*) **Ricarda** (1864–1947) German poet and novelist opposed naturalism outstanding as critic and as historical novelist (Defeat Victory historical romances of Garibaldi The Deruga Trial)

Huck or **huckaback** toweling of linen or cotton with small woven design durable absorbent

Huckleberry a blueberry B 211

Huckleberry Finn The Adventures of Mark Twain s novel about Huckleberry Finn, a reckless boy who resenting the restraint of civilization runs away from home with his friend Tom Sawyer the two becoming involved in a series of lively incidents connected with slavery troubles before the Civil War A 230 T 225 *picture* A 229

Huddersfield England manufacturing town 25 mi ne of Manchester pop 129 021 wool cloth center *map* B 225

Hudibras (*hū di brăs*) hero of mock epic poem (Hudibras) by Samuel Butler satire on Puritanism

Hudson Henry (1575?–1611) English navigator H 437 *picture* H 437
Delaware Bay P 138 D 47
explores Hudson River H 437 A 191
flag F 130a *color picture* F 128
voyages *map* A 189

Hudson Henry Norman (1814–86) Episcopal clergyman Shakespearean scholar born Cornwall Vt

Hudson W (illiam) H(enry) (1841–1922) English naturalist and writer, Galsworthy called him a simple narrator who is well nigh unsurpassed a stylist who has few if any living equals (*The Purple* Land Green Mansions romances Tales of the Pampas short stories Far Away and Long Ago autobiography The Book of a Naturalist) E 382a *N 311*

Hudson N Y port of entry on e bank of Hudson River 28 mi s of Albany pop 11 629 cement knit goods machinery *matches once* important whaling port *map* N 205

Hudson Bay Canada the 3d largest landlocked sea in the world H 437 *maps* C 67 9 N 245 *See also in Inlet* Ocean *table*
discovery and exploration H 437
Radisson finds old forts F 322
river system *map* U 256–7

Hudson Bay Railroad C 83

Hudson Bay sable S 193

Hudsonian curlew *S 209* *See also in Index Curlew*

Hudsonian godwit a shore bird *See in Index* Godwit

Hudsonian life zone N 258 *map* N 258

Hudson River *principal river of New* York State one of chief highways of commerce in U S H 437 *maps* N 196 205 U 265 *pictures* N 195 207
George Washington Bridge B 308 *pictures* N 219 W 182 *See also in Index* Bridge *table*
highway to the west U 265 N 198
Palisades H 438 *picture* N 157
steam navigation begins F 315
tunnels T 209 N 224 *picture* N 223

Hudson River School of American painters P 38

Hudson s Bay Company British trading company in Canada H 438 C 87, 95b
chain of stores first in North America C 131
competition with U S F 324–5
fur trade H 438 F 323–6 T 176 *pictures* T 176 F 326
Manitoba M 80 *picture* M 78
Northwest Territories N 298
Oregon Country O 419 20 Fort Boise I 23
origin and growth F 322–5
sells land to Canada C 99
signing of charter *picture* C 96

Hudson seal muskrat fur M 473

Hudson Strait connects Hudson Bay with Atlantic H 437 *map* C 69

Hué (*u a*) fortified city capital of Annam Indo China pop 407 000 on Hué River 10 mi from mouth I 125 *maps* I 123 A 407

Hue in color C 394 395 *color chart* C 393

Hue and cry old English common law practice of pursuing criminal with horn and voice (hue from old French verb *huer* to cry or shout)

Huenefeld (*hu nĕ fĕlt*) **Gunther von Baron** German aviator
nonstop flight, Europe to America *table* A 104

Huerta (*wer ta*) **Victoriano** (1854–1916) Mexican general full blooded Indian overthrew Madero and made himself president 1913 resigned 1914 arrested in U S for fomenting a revolution against Mexico died before trial M 207

Huey P Long Bridge New Orleans *N 183* *picture* B *307*

Huggins Sir William (1824–1910) English astronomer pioneer in spectroscopic astronomy introduced spectroscopic photography into astronomy (Atlas of Representative Stellar Spectra) N 106

Hugh Saint (1024–1109) abbot of Cluny born Sémur France adviser of several popes aided in reform of clergy raised Abbey of Cluny to place of highest importance amalgamating other monasteries festival April 29

Hugh Capet *See in Index* Capet, Hugh

Hughes Charles Evans (1862–1948) American lawyer and statesman chief justice of U S Supreme Court (1930–41) H 438–9 *pictures* H 439
Theodore Roosevelt supports P 226
Washington naval conference H 267

Hughes David Edward (*1831–1900*) American inventor born England invented printing telegraph microphone and induction balance

Hughes Hatcher (1881–1945) playwright, born Polkville N C long a teacher of English Columbia Uni

versity ('Hell-Bent fer Heaven', 1924 Pulitzer prize winner, folk play of Carolina mountains).
Hughes, Howard Robard (born 1905), capitalist and aviator, born Houston, Tex.; established airplane speed records 1935–38: *table* A-104
Hughes, (James) Langston (born 1902), Negro poet, born Joplin, Mo.; ability discovered by Vachel Lindsay when Hughes was working as a hotel busboy; much of work deals with Negro life ('Shakespeare in Harlem', 'Fields of Wonder', poetry; 'Simple Speaks His Mind', short stories; with Arna Bontemps edited 'Poetry of the Negro, 1746–1949').
Hughes, John J. (1797–1864), Roman Catholic prelate, born County Tyrone, Ireland; bishop of New York 1842–51, archbishop after 1851; noted for humanitarian work and writings in defense of Catholicism.
Hughes, Rupert (born 1872), editor and writer, born Lancaster, Mo.; his 'George Washington' sought to strip the hero of myth and show him as a human being ('Stately Timber', novel, edited 'Music Lovers' Encyclopedia').
Hughes, Sir Sam (1853–1921), Canadian soldier and political leader H-439
Hughes, Thomas (1822–96), English author and social reformer, founder of an experimental co-operative colony at Rugby, Tenn., his book 'Tom Brown's School Days' did much to fix ideals of English public schools; also author of 'Tom Brown at Oxford' and 'Life of Alfred the Great'.
Hughes, William Morris (1864–1952), Australian labor and political leader, born London, England; in Australia after 1884; prime minister 1915–23; government posts 1934–41; leader (1941–43) and deputy leader (1943–44) of United Australian party
Hugh of Lincoln, Saint (1140?–1200), bishop of Lincoln; born Avalon, France, of noble family; called to England by Henry II to establish English Carthusian monastery; festival November 17. Another St. Hugh of Lincoln was an English boy said to have been put to death by Jews at Lincoln in the 13th century; festival July 27.
Huginn (*hoo-gin'*), in Norse mythology, a black raven, *picture* O-341
Hugli, channel in Ganges River. *See in Index* Hooghly
Hugo (*hü'gō*, French *ü-gō'*), **Joseph Leopold**, father of Victor Hugo H-440
Hugo, Victor Marie (1802–85), French writer H-440–2, *picture* H-440
books by and about H-441
drama basis of 'Rigoletto' O-392
dramatist and poet, estimate H-441
leader of Romanticists H-441
'Les Misérables' H-441–2
Huguenots (*hü'gē-nŏts*, French *ü-gē-nō'*), French Protestants of 16th and 17th centuries H-442–3
American Colonies A-197, A-191, H-443; Florida F-150
Coligny C-382
Henry II begins persecution H-338
Henry of Navarre and the Edict of Nantes H-339
Richelieu crushes R-152
St. Bartholomew's Massacre C-382, C-194, H-442
'Huguenots, The', opera by Meyerbeer story O-390: basis for H-443
Hukbalahaps, or **Huks**, Communist-directed members of a Philippine guerrilla army organized during Japanese occupation in World War II; after war kept arms and joined peasant political parties in demanding breakup of large estates; leader, Luis Taruc, surrendered 1954: P-202
Hulagu Khan (*hu-lä'gŏo kän*) (died 1265), Mongol leader, grandson of Genghis Khan, first independent ruler of Persia M-345
Hull, Cordell (1871–1955), statesman, born Overton (now Pickett) County, Tenn.; member U.S. Congress 1907–21, 1923–31; U.S. senator 1931–33, secretary of state 1933–44; advocate of free trade, awarded Nobel peace prize for 1945 R-203
Pan American relations L-120
Hull, Isaac (1773–1843), commodore who gained first American naval victory in War of 1812, born Huntington (now Shelton), Mass
commands *Constitution* W-13
Hull, John (1624–83), silversmith and merchant; came to U.S. from England 1635, settled in Boston, took leading part in affairs of Massachusetts Bay Colony, became master of the mint 1652
Hull, John E(dwin) (born 1895), U.S. Army officer, born Greenfield, Ohio; became 4-star general Aug 1951; Army vice chief of staff 1951–53; U.N. commander in Korea and commander in chief of U.S. Far East forces 1953–55; retired.
Hull, William (1753–1825), American Revolutionary War officer, general in War of 1812, surrendered Detroit to British 1812; court-martialed and sentenced to be shot, but pardoned by President Madison
Fort Dearborn evacuation C-237
governor of Michigan Territory M-229
Hull, officially **Kingston-upon-Hull**, seaport in n.e. England on Humber River; pop. 299,068; naval arsenal; fisheries; commerce: *map* B-325
Hull, industrial city in s.w. Quebec opposite Ottawa, Ontario; pop. 43,483; lumber products, matches, paper, cement: O-428, *maps* C-69, 72
Hull
aircraft carrier N-83
motorboats B-217
sailboat types B-216
ship S-158. *See also in Index* Nautical terms, *table*
submarine S-435
Hull House, famous social settlement in Chicago A-17–18, P-86*a*
Hull Island, in Pacific. *See in Index* Phoenix Islands
Hulutao (*hŭ'lŭ'dou'*), Manchuria, seaport on w. shore of Gulf of Liaotung M-75
Human behavior. *See in Index* Behavior, human
Human body. *See in Index* Anatomy; Physiology
'Human Comedy, The', name given to a series of novels by Balzac B-42
Humane Action Medal, U.S. D-39
Human engineering, in psychology P-428
Humane societies, organizations for the prevention of cruelty to animals and children H-443, *pictures* H-443
Human geography, study of earth as the home of man G-47, S-221
Humanism, the movement at the close of the Middle Ages that brought about a revival of classical learning and tastes; also a modern literary and philosophical movement opposed to modernism
Chaucer poet of C-201–2
Renaissance R-104
Humanistic handwriting B-235–6
Humanities, in education E-252, 253
Human Nutrition and Home Economics, Bureau of, U.S. H-409, U-364, *picture* U-365
Human resources, conservation of. *See in Index* Conservation of human resources
Human Rights, U. N. Commission on U-243
Covenant U-243
Universal Declaration U-242, 243
Human Rights Day U-242
Human society, study of S-220–2. *See also in Index* Sociology
Human Ten Pins, a game P-320
Humber River, estuary formed by Trent and Ouse rivers in n.e. England, *maps* B-321, 325
Hum'bert I (1844–1900), king of Italy; succeeded 1878; called Humbert the Good because of courage and generosity in plague and earthquake, fostered Triple Alliance, inaugurated colonial expansion policy assassinated I-274
Humbert II (born 1904), king of Italy May 10–June 18, 1946; son of Victor Emmanuel III, for whom he became regent 1944; left Italy 1946 when Italians voted for republic.
Humblebee. *See in Index* Bumblebee
Hum'boldt, Alexander, baron von (1769–1859), German naturalist, explorer, founder of modern science of physical geography ('Kosmos') G-46, 47
Humboldt, Karl Wilhelm, baron von (1767–1835), German philologist, statesman, and writer, first to define philosophy of speech; brother of Alexander von Humboldt.
Humboldt Current, also called **Peru Current**, an ocean current which flows from Antarctic regions up w. coast of South America; average temperature about 60° F.: O-335, 336, *maps* O-335–6
climate affected: Chile C-250–1; Galápagos Islands G-3; Peru P-161; South America S-261
Humboldt Lake, or **Humboldt Sink**, in w. Nevada; 20 mi. long; receives Humboldt River; has no outlet; usually only a marsh, becoming a lake at certain seasons: *maps* N-126, 132
Humboldt River, rises in n.e. Nevada, flows 375 mi. into Humboldt Lake (or Sink): N-124, *maps* N-126, 132, U-303
Humboldt State College, at Arcata, Calif.; chartered as state normal school 1913; became state college 1935; arts and sciences, education.
Humboldt's woolly monkey, *picture* M-348
Hume, David (1711–76), Scottish philosopher and historian ('An Enquiry concerning Human Understanding'; 'History of England'): E-245
Hume, Samuel (born 1885), play producer, born San Francisco; associated with Edward Gordon Craig; organized first exhibition of stagecraft in United States.
Hume Dam, in Australia, on Murray River, *picture* A-491. *See also in Index* Dam, *table*
Hu'merus, bone of the upper arm S-192
Humid'ity, moisture in air W-81*a*, E-450
air conditioning A-77, 78
houses: furnace humidifier H-323, *picture* H-322; proper degree W-200
hygrometer measures H-461
trees affect T-179
Hummingbird H-444, *pictures* H-444, color *picture* B-182
courtship, *picture* B-172
eggs and care of young B-174
nest H-444, B-172, F-53
speed in flight B-156

Humor *See also in Index* Comedy, Parody Satire
American characteristic F 65
ancient Greek drama D 130–1
Canadian literature C 1066
Chaucer C 201
conversational C 459
English characteristic F 65
nonsense rhymes and stories value in children's reading R 84–84a
Humors body ancient belief M 164b
Humors of the eye E 459
Hump in railway switching R 67 *picture* R 65
Humpbacked fly name for tiny black flies (family *Phoridae*) with humped thorax and short abdomen some larvae live as parasites inside wasps bees and other insects some infest mushrooms F 189
Humpbacked salmon or pink salmon S 28
Humpback whale W 114 *picture* W 113
migration M 244 *map* M 241
Humped ox *See in Index* Zebu
Humperdinck (*hŭm pĕr dingk*) **Engelbert** (1854–1921) German composer born Siegburg near Bonn Germany friend of Wagner whom he assisted in producing *Parsifal won fame with opera Hansel and* Gretel exerted influence on opera of his time by reviving interest in folk themes wrote incidental music for many stage productions of Max Reinhardt including The Miracle *See also in Index* Hansel and Gretel
Humphrey Doris (born 1895) modern dancer and choreographer born Oak Park Ill studied with Ruth St Denis and Ted Shawn with Charles Weidman conducted school in New York City important work at Bennington College Vermont D 144k *m picture* D 141
Humphrey George M(agoffin) (born 1890) industrialist and public official born Cheboygan Mich practiced law in Saginaw Mich 1912–18 joined M A Hanna Company Cleveland Ohio 1918 president 1929–52 chairman of board May–Dec 1952 became U S secretary of treasury 1953 *picture* L 287d
Humphrey of Gloucester *See in Index* Gloucester duke of
Humphreys David (1752–1818) soldier and minor poet of the Revolution born Derby Conn aide de camp to Washington minister to Portugal and Spain introduces Merino sheep A 63
Humphreys Joshua (1751–1838) shipbuilder born Pennsylvania outstanding naval architect U S naval constructor 1794 1801 N 92
Humphreys Peak highest peak of San Francisco Mountain 12 652 feet in Coconino County Ariz highest point in state *map A 352*
Humulus genus of hops H 424
Humus (*hū mus*) soil S 228 C 452b ferns F 53
flood control F 145 146
Hun *See in Index* Huns
Hunan an inland province of China 81 393 sq mi pop 36 171 117 capital Changsha immense coal and iron deposits one of chief tea producing regions of the world *map* C 260
Hunchback of Notre Dame *See in Index* Notre Dame de Paris
Hundred *a territorial* unit of government
England D 64
Hundred board *picture* N 312b
Hundred Days period between Napoleon's return to Paris from Elba March 20 1815 and the restoration of Louis XVIII June 28 N 11 L 321
Hundred handers (Hecatoncheires) giants in Greek mythology U 405
Hundredweight a unit of measure *table* W 88
Hundred Years War (1337–1453) between England and France H 445–7 *pictures* H 445 447
archery H 445 446 A 56 *pictures* H 337 H 445 447
battle of Agincourt A 56 H 446 *picture* H 337
battle of Crécy H 445
capture of Calais C 18
Charles VII ends C 194
Estates-General role of F 398
Froissart's Chronicles F 391
Joan of Arc J 355–6 *pictures* C 193 H 447
Huneker (*hun ĕ kĕr*) **James G** (1860–1921) essayist also music literary and dramatic critic born Philadelphia (Mezzotints in Modern Music *Chopin the Man and His Music* Iconoclasts Egoists Unicorns Steeplejack autobiographical)
Hungarian or Magyar language H 448
Hungarian partridge Q 1 2
Hungary (*hŭng gă rĭ*) (Hungarian *People's Republic*) a country in central Europe 35 912 sq mi pop 9 204 799 cap Budapest H 448–51 *maps* A 497 D 416–17 465 *pictures* H 449 50
agriculture H 448 farm life H 448 *pictures* H 449–50
bibliography A 499 E 448
Carpathian Mountains C 127
children *picture* H 449
cities H 448 Budapest B 338
climate H 448 rainfall R 71
clothing *pictures* H 449–50 B 25
commerce B 338 *See also in Index Trade table*
education *H 448*
emigration to United States I 48
flag F 136b *color picture* F 132
history H 448 51 *Reference Outline* A 499 *See also in Index* Austria Hungary
Otto I defeats Magyars *O 430* H 448
Hapsburg claim established by Frederick III F 282
Turks conquer T 290 B 338
Kossuth and Revolution of 1848 K 67–8
Dual Monarchy *H 450 A 499*
World War I peace settlement (Treaty of Trianon) H 450
government changes H 450
World War II H 451 Russian invasion W 269 peace treaty W 299b 300
territorial *gains nullified H 451* cedes land to Czechoslovakia C 536
Russian influence H 451
minerals H 448
national hymn N 41
people H 448
products H 448
relationships in continent *maps* D 416–17 419–20 429 429 I
religions H 448
rivers H 448 Danube D 15–16
Hungary University of B 338
Hunger
motivating *force E 340*
Hungry Horse Dam in Montana on South Fork of Flathead River M 377 *map* M 367 *picture* D 9 *See also in Index* Dam *table*
Hung Wu Chinese emperor *See in Index* Chu Yüanchang
Hunley *early submarine S 437*
Hunnemannia (*hŭn nĕ măn nĭ ă*) a genus of perennial plants of poppy family native to desert regions of Mexico Leaves covered with a bloom flowers like California poppy yellow also called bush escholtzia Mexican tulip poppy golden cup Santa Barbara poppy
Huns *barbarian people of central Asia* who invaded Europe in 4th and 5th centuries H 451
racial classification *chart* R 22
Huns White *See in Index* White Huns
Hunt Clara Whitehill (born 1871) librarian and author born Utica N Y superintendent children's department Brooklyn Public Library 1903–39 writer of children's books depicting American home life ('What Shall We Read to the Children?' About Harriet)
Hunt Sir (Henry Cecil) John (born *1910*) British army officer and mountaineer born India leader of British expedition that scaled Mount Everest the summit being reached May 29 1953 by Tenzing Norkay a Nepalese guide and E P Hillary of New Zealand knighted by *Queen Elizabeth II* author of The Conquest of Everest
Hunt Holman (1827 1910) English pre Raphaelite painter ('The Light of the World Finding of Christ in the Temple')
Hunt Leigh (1784–1859) English poet and essayist, friend of Byron Keats, and Shelley ('Abou Ben Adhem Autobiography')
Hunt Mabel Leigh (born 1892) author of children's books born Coatesville Ind after special schooling served as children's librarian at Indianapolis Public Library until 1938 her writings reflect her double Quaker ancestry (Benjie's Hat Little Grey Gown Better Known as Johnny Appleseed 'Ladycake Farm')
Hunt Richard Morris (1827–95) *American architect* born Brattleboro Vt brother of William Morris Hunt designed pedestal for Bartholdi's Liberty Administration Building of Chicago World's Fair 1893 and many other notable structures established earliest *American training school of* architecture
Hunt Walter (1792?–1859) American inventor in 1834 of first practical sewing machine S 115 117 P 257
Hunt William Morris (1824–79) *American painter born Brattleboro* Vt brother of Richard Morris Hunt influenced by Barbizon School painted portraits landscapes and murals
Hunt Wilson Price (1782? 1842) fur trader and explorer led expedition of Astor's Pacific Fur Company overland from St Louis to Astoria at the mouth of the Columbia River (1810–12) explored land and established trading posts
Idaho expedition I 23
South Dakota traversed S 305
Hunter John (1728–93) British physiologist and surgeon born Glasgow Scotland one of world's greatest anatomists work led to notable advances in surgery introduced experiment into study of physiology buried Westminster Abbey M 165
Hunter Kermit (born 1910) dramatist, born West Virginia (Unto These Hills) P 19a
Hunter Robert Mercer Talliaferro (1809–87) Confederate secretary of state (1861) and peace commissioner (1865) born Essex County Va member of Congress 1837–41 and 1845–47 in senate 1847–61
Hunter Walter Samuel (1889 19 4) psychologist, author and editor born Decatur Ill professor University of Kansas Lawrence Kan

1916–25, Clark University, Worcester, Mass., 1925–36; professor and department head Brown University, Providence, R.I., 1936–54; P-428
Hunter College, at New York City, part of the College of the City of New York; municipal control; established 1870 as Normal College (name changed 1914); arts and sciences; also model kindergarten, elementary school, and high school; N-223
United Nations meets at U-240*b*
Hunter's fire, or trapper's fire C-61
Hunter's moon M-387
Hunting H-451–451*b*, *pictures* H-451*a–b*
ammunition used A-236*a*, *picture* A-236
boar B-212, *picture* B-212
dogs for D-110*a–b*, *pictures* D-110, 117, H-451*a*, *color pictures* D-112–14, *table* 118–118*a*
elephant E-327, 328, *picture* E-326
Eskimo customs E-394–5, *pictures* E-394, 396
falconry F-14–15, *picture* F-14
firearms used F-80–1, H-451–451*a*, *pictures* F-78
fox D-110*b*, *picture* E-349; 'Wolf and Fox Hunt', by Rubens P-27*d*, *color picture* P-28
gun handling, rules of H-451
horns used H-427
laws governing H-451*b*, B-195–6; early laws B-194
opossum O-399
quail Q-1
rhinoceros R-135
seals, *picture* E-394
tiger E-327–8
Hunting dog D-110*a–b*, *pictures* D-110, 117, H-451*a*, *color pictures* D-112–14, *table* D-118–118*a*
trailing coyote, *picture* H-451*a*
Hunt'ingdon, or Hunt'ingdonshire, a small inland county in e. England; 366 sq. mi.; pop. 69,273; cap Huntingdon (pop. 2499): *map* E-347
Huntingdon College, at Montgomery, Ala.; Methodist; chartered 1854, opened 1856 in Tuskegee; moved to Montgomery in 1909; arts and sciences.
Hunting leopard, or cheetah L-171
Huntington, Anna Hyatt. *See in Index* Hyatt, Anna Vaughn
Huntington, Collis Potter (1821–1900), American capitalist, born Harwinton, Conn.; one of chief promoters of Central Pacific, Southern Pacific, and Chesapeake and Ohio railroads.
Huntington, Ellsworth (1876–1947), geographer and explorer, born Galesburg, Ill.; research associate, Yale University; expeditions into Asia; made studies of climatic variations and weather changes ('The Pulse of Asia'; 'The Climatic Factor'; 'The Human Habitat')
clues to past droughts D-152
studies in U.S. climate C-351
Huntington, Harriet E. (born 1909), author and artist, born Los Angeles, Calif.; studied music and dancing. Her books for children follow the developing interests of her two sons. 'Let's Go Outdoors'; 'Let's Go to the Desert'; 'Tune-up'; 'Aircraft U.S.A.'
Huntington, Henry Edwards (1850–1927), railway official and art collector, born Oneonta, N.Y.; bequeathed to public his estate in San Marino, Calif., with one of finest collections of art, English manuscripts and Americana in world museum. *See in Index* Henry E. Huntington Library and Art Gallery
Huntington, Samuel (1732–96), signer of Declaration of Independence; born Windham, Conn.; governor Connecticut (1786–96)
signature reproduced D-37
Huntington, Ind., manufacturing city on Little Wabash River, 23 mi. s.w. of Fort Wayne; pop. 15,079; lime, iron and steel products, shoes, rubber goods; Huntington College: *map* I-78
Huntington, N. Y., residential area in n. Long Island, 35 mi. from New York City; pop. 9324; includes West Hills, birthplace of Walt Whitman: *map, inset* N-204
Huntington, W. Va., largest city of state; on Ohio River; 45 mi. w. of Charleston; pop. 86,353; r.r. shops; glass, iron, clay, and wood products; Marshall College: *maps* W-106, U-253
Huntington Library. *See in Index* Henry E. Huntington Library and Art Gallery
Huntington Park, Calif., residential suburb and manufacturing city 10 mi. s.w. of Los Angeles; pop. 29,450; truck farming, citrus fruit growing, poultry raising, auto supplies, furniture, steel, iron: *map, inset* C-35
Huntsman, Benjamin (1704–76), English inventor and steel manufacturer S-138, I-247
Huntsville, Ala., city 85 mi. n. of Birmingham; pop. 16,437; farming and stock raising; textiles, cottonseed oil, lumber; rocket research and guided missile center; State Agricultural and Mechanical College: A-116, 129, *maps* A-126, U-253
Huntsville, Tex., city 70 mi. n. of Houston, pop. 9820; cotton trade; state penitentiary; Sam Houston State Teachers College: *map* T-90
Hunyady (*hŏn'yə-dē*), **Janos, or John** (1387?–1456), national hero of Hungary, great warrior and statesman; by his defense of Belgrade against the Turks in 1456 made Hungary independent for 70 years: H-450, T-220
Hupa, an Athapascan Indian tribe of n. California, noted for fine basketry and elaborate costumes.
Hupeh (*hŭ'bĕ'*), province of central China; 80,190 sq. mi.; pop. 21,034,463; important iron deposits; Hankow center of China's iron and steel industry; cotton, silk, tobacco, timber; cap. Wuchang: *map* C-260
Hura. *See in Index* Sandbox tree
Hurd, Peter (born 1904), painter, born Roswell, N.M.; studied with N. C. Wyeth and married his daughter Henriette, also a painter; especially noted for scenes of American Southwest.
Hurdling, racing on foot over short distances in which ten hurdles, or light movable fences, have been placed; competitor disqualified if three or more hurdles are upset, or if he trails his leg or foot alongside any hurdle: *pictures* O-381, T-162
world records, *table* T-161
Hurley, Edward Nash (1864–1933), manufacturer and public official, born Galesburg, Ill.; chairman Federal Trade Commission; chairman U.S. Shipping Board and president Emergency Fleet Corporation 1917–19.
Hurley, Patrick Jay (born 1883), lawyer, statesman, and U.S. Army officer, born Choctaw Nation in present state of Oklahoma; attorney for Choctaw Nation 1912–17; served in World War I; helped organize U. S. Chamber of Commerce 1912; U. S. secretary of war 1929–33; first U.S. minister to New Zealand 1942–43; F. D. Roosevelt's representative in Middle East 1943, made ambassador to China Nov. 1944; resigned Nov. 1945.
Hurley, Irish name for hockey.
Huron, or Wyandot, tribe of Iroquoian Indians originally living in Ontario along Georgian Bay; driven into upper peninsula of Michigan; later into lower peninsula and Ohio, now lives in Quebec: *map* I-106*f*, *table* I-107
Kansas City, Kan., settlement K-16
Ontario, Canada O-387
Huron, S. D., city about 110 mi. e. of Pierre; pop. 12,788; distributing center for large agricultural and stock-raising area; meat packing; Huron College: *maps* S-303, U-252–3
Huron (*hū'rŏn*), **Lake**, 2d largest of the Great Lakes H-451*b*–52, G-178–85, *maps* G-179, 181
canals: Sault Sainte Marie S-49; Trent C-109, H-452
Detroit commerce D-75
height and depth, *diagram* G-179
size, comparative. *See in Index* Lakes, *table*
Huron College, at Huron S. D.; Presbyterian; founded 1883 at Pierre as Pierre University; name and location changed 1898; arts and sciences, music.
Huronian period, or Algonkian period, in geology, *table* G-57
Hurrians (*hŭr'i-ănz*), a people of Babylonia about 1500 B.C. B-8
Hurricane S-403–403*a*, W-81*b*, *pictures* S-403*a*
Caribbean Sea C-122, W-94
Galveston G-7
Miami, Fla. (1926) M-211
Hurst, Fannie (Mrs. Jacques S. Danielson) (born 1889), author, born Hamilton, Ohio; worked in New York as actress, shop girl, waitress; first won success with short stories, particularly of Jewish life in America; later wrote novels ('Lummox'; 'A President Is Born'; 'Five and Ten'; 'Hands of Veronica') and plays ('Humoresque'; 'Land of the Free').
Hurstmonceux Castle, also Herstmonceux Castle, England, site of Royal observatory L-133
Hurston, Zora Neale (born 1901), Negro author, born Eatonville, Fla.; vivid stories of Negro life ('Jonah's Gourd Vine'; 'Mules and Men'; 'Moses, Man of the Mountain'); studied voodoo rites in the West Indies, on Guggenheim Fellowship ('Tell My Horse'; 'Dust Tracks on a Road', autobiography).
Hürtgen (*hürt'gĕn*), village in West Germany, 23 mi. w. of Bonn, *map* G-88
Hürtgen Forest in World War II W-283
Husein. *See in Index* Hussein
Husein, grandson of Mohammed. *See in Index* Hasan and Husein
Hu Shih (*hŏ' shĕ'*) (born 1891), Chinese philosopher and writer; ambassador to U.S. 1937–42; edited *Endeavor* and *Independent Critic*; reformed Chinese classical language into "pai-hau" ("clear talk"); became president of National Peking University 1947: C-276
Huskies, sled dogs of the North. *See in Index* Eskimo dog; Malamute; Siberian Husky.
Husking bee P-265, *picture* U-375
Huss, Henry Holden (1862–1953), American pianist and composer; with his wife, Hildegard Hoffman, soprano, gave recitals; composed piano and violin concertos, songs, and choral works.

Huss John (about 1369–1415) Bohemian religious reformer and martyr H 452 *picture* H 452
John Huss Day F 59

Hussar (*hŭ zar'*) light horse cavalryman type originated in Hungary in 1458 from Magyar word *huzz*, twenty because in levying troops one out of every 20 men was taken

Hussein (*hu sān'*) I (born 1935) king of Jordan (*May 1953*) *succeeded* father Talal T 167

Hussein ibn Ali (*ib n ā lī'*) (1856–1931) first king of the Hejaz and recognized by Mohammedans as senior descendant of Mohammed for services with British during World War I made king of Hejaz 1916 caliph 1924 six months later overthrown retired to Cyprus succeeded by his son **Ali ibn Hussein** (*18 8–1935*) *who* ruled until 1925 His second son **Abdullah** *became* king of Jordan and his third son **Faisal** king of Iraq *See also in Index* Abdullah ibn Hussein Faisal I
Ibn Saud and A 290

Hussey Obed (1792 1860) inventor born in Maine sailor in early life invented corn grinder *sugar* cane crusher and machine for *making pins rival of* Cyrus H McCormick as inventor and manufacturer of the reaper M 5

Hus site Wars (1419–34) H 452

Huston Tillotson College at Austin Tex founded 1876 at Dallas Tex as St Andrews Normal College arts and sciences education

Hutchins Robert Maynard (born 1899) educator born Brooklyn N Y dean of Yale Law School 1928–29 president of *the University* of Chicago 1929–45 chancellor 1945 *51 became* associate director Ford Foundation 1951 author of The Conflict in Education in a Democratic Society and The University of Utopia L 254

Hutchinson Anne (1591 1643) American religious leader H 452–3 A 208 *picture* H 453

Hutchinson Arthur Stuart Menteth (born *1879*) *English novelist* born India (Once Aboard the Lugger *The Happy Warrior* If Winter Comes This Freedom One Increasing Purpose)

Hutchinson Thomas (1711–80) Tory governor of province of Massachusetts and historian born Boston Mass (History of the Colony of Massachusetts Bay)
quoted A 16

Hutchinson Kan *manufacturing* city on Arkansas River 42 mi nw of *Wichita pop* 38 575 salt flour fiber products wheat poultry and cream center *maps* K 11 U 252

Hutten (*hut'ĕn*) **Ulrich von** (1488–1523) German humanist reformer poet and satirical writer *author of* notable Latin verse member of Luther s party *in Protestant* Reformation

Hutterian *Brethren* or Hutterites a Christian sect like the Mennonites except for the r belief in the common ownership of things name comes from Jacob Hutter an Anabaptist minister who *was burned* at the stake in Innsbruck 1536 followers *flourished in* Moravia fled to Russia 18th century went to *South Dakota* 1874 use the German language believe in nonviolence live chiefly in rural areas

Hutton James (1726–97) Scottish landowner and geologist propounded modern view *that existing* land forms were developed gradually by processes that are at work *today* (*Theory of the Earth*)

Huxley Aldous Leonard (born 1894) *English writer grandson of Thomas* H Huxley and nephew of Mrs Humphry Ward earlier works brilliantly satirical later ones show mystical trend wrote novels (Antic Hay Point Counter Point Brave New World Eyeless in Gaza Time Must Have a Stop) essays (On the Margin Jesting *Pilate Themes and Variations*) and poems (Leda) F 383 N 311

Huxley *Julian* (*born 1887*) *English* biologist and writer brother of Aldous director general United Nations Educational Scientific and Cultural Organization 1947 48 (The Stream of Life Religion without Revelation The Uniqueness of Man)

Huxley Thomas H (1825–95) English biologist and essayist H 453–4 L 98
wanted science in schools E 254

Huygens (*hī'gĕn* Dutch *hoi'kens*) **Christian** or **Christiaan** (1629 95) Dutch mathematician astronomer and physicist applied pendulum to the clock improved the telescope and discovered a satellite of Saturn wave theory of light L 232 P 234

Huygens Sir Constantijn (1596–1687) Dutch poet one of ablest in Dutch language sent to Venice and *twice to London on diplomatic mis* sions friend of John Donne knighted by James I

Huysmans (*ü ĕs mäⁿs'*) **Joris Karl** (1848–1907) French realistic novelist a master of psychological analysis (A rebours En route La Cathédrale *En Ménage* Là bas) F 288

Hwang Hai *in part of East China* Sea *See in Index* Yellow Sea

Hwango Ho Honng Ho Huang River or **Yellow River** 2d largest river in China (2700 mi) H 454 C 259 I 253 *maps* C 259 A 406 411 12 length comparative *See in Index* Rivers *table*

Hyacinth a transparent yellow red orange or brown variety *of zircon* used as a gem also a yellow or *cinnamon garnet* The hyacinth of the ancients was probably a sapphire M 266
zircon J 350

Hyacinth plant of the lily family with flowers clustered into spikes H 454–5 *picture* H 454
Netherlands *N 118*

Hyades (*hī'ą dēz*) a *V shaped group* of stars contained in the constellation *Taurus* includes bright red star Aldebaran *chart* S 381

Hyatt Anna Vaughn (Mrs Archer M Huntington) (born 18 6) sculptor born Cambridge Mass work includes animal sculptures equestrian statues figure pieces

Hyatt *John Wesley* (*1837–1920*) inventor born Starkey N Y *contributions* include the development of celluloid and the invention of the Hyatt filter for purifying water while it is in motion

Hyattsville Md town 6 mi ne of Washington D C residential suburb pop 12 308 *map inset* M 116

Hybrid a plant or animal produced by crossbreeding H 344 L 452
animals
cattle cattalo B 201 C 146
mule H 428*b*–a *picture* H 428*b*
plant life P 305 6 307
Burbank s work B 356 357
corn C 483 *pictures* C 481
flowers carnation C 123 Mendel s work on pea *diagrams* H 345 roses R 230–2 *pictures* R 230–2 *Shasta daisy* D 5
fruits F 303 Bartlett plum P 322 kumquat L 244 loganberry L 295 R 76 pears P 105 plum cot B 356 raspberry R 76
wheat W 116

Hybridization in biology E 452

Hydaspes River Punjab *See in Index* Jhelum River

Hyde Arthur M (*1877 1947*) *U S* secretary of agriculture under President Hoover born Princeton Mo governor of Missouri 1921–25

Hyde Douglas (1860–1949) Irish scholar and author first president of Eire (Ireland) serving 1938 45 *well known* for his work to make Gaelic a living language president of *Gaelic League of which he was a* founder 1893–1915 wrote A Literary History of Ireland translations from Gaelic and plays

Hyde Edward *See in Index* Clarendon

Hyde William DeWitt (1858–1917) educator and writer born Winchendon Mass ordained as Congregational *minister 1883 president* Bowdoin College 1885–1917 and professor of mental and moral philosophy (Practical Ethics Practical Idealism Self Measurement The Quest of the Best The Five Great Philosophies of Life)

Hyde Park London L 305 *map* L 300

Hyde Park N Y village on Hudson 5 mi n of Poughkeepsie pop 1059 Home of F D Roosevelt R 199 N 20 *map* N 205 *pictures* F 216 memorial library *pictures* R 217

Hyderabad (*hī'dĕr ą bad*) state of India area *82 168 sq mi pop* 18 605 108 cap Hyderabad H 455 *map* I 52*a*

Hyderabad India capital of Hyderabad state pop 1 085 722 *maps* I 54 A 407

Hyder Ali (*hī dĕr' ą lē'*) (1722?–82) Indian ruler and commander most formidable Asiatic rival of British *power broken by British* H 280

Hydra in Greek mythology monster slain by Hercules H 342

Hydra a primitive water animal H 455 6 L 224*b* *pictures* H 455–6, L 224*b*
jellyfish *picture* J 333
reproduction H 458 picture A 250d

Hydra a southern constellation *chart* S 376

Hydrangea (*hī drān'jē ą*) H 456
hedges H 329

Hydraotes River in Punjab *See in Index* Ravi

Hydrargyrum *Latin and chemical* term for mercury or quicksilver *table* C 211

Hydration in chemistry C 216

Hydraulic cement cementing substance which hardens after wetting portland cement C 165–6 167

Hydraulic dredge *one that excavates* under water by suction D 143

Hydraulic elevator E 329

Hydraulic engineering a branch of civil engineering *See in Index* Aqueducts Artesian wells Dam Dike Dredge Harbors and ports Irrigation and reclamation *Levee* Locks canal Turbine Water sup

ply and waterworks, and all Index headings beginning with Hydraulic
Hydraulic machinery, machinery which uses water, or another liquid as a power source or to apply power to work H-456–8, *pictures* H-457
automobile brakes A-525–6, *diagrams* A-526, fluid coupling A-520, *diagrams* A-519, torque converter A-522–3, *diagrams* A-522
elevator E-329
press H-458, *picture* H-457: bookmaking B-244
ram H 456, *picture* H-457
water turbines W-68, T-212, *pictures* W 69, T-212
water wheels W-68, *pictures* W-62
Hydraulic mining, excavation of surface ore by washing down with powerful streams of water G-132, *picture* G-41
Hydraulic press H-458, *picture* H-457
bookmaking B-244
Hydraulic ram H-456, *picture* H-457
Hydraulics, the science of force and motion in liquids H-458, *Reference-Outline* P-237 *See also in Index* headings beginning with Hydraulic
Hydroairplane *See in Index* Seaplane
Hydrocarbons, class of compounds of hydrogen and carbon H-458–9, C-120, O-424–424*b*, *diagrams* H-458–9, O-424*a–b*
aromatic or benzene series *See in Index* Aromatic series
candle flame combustion B-352–3
chlorinated in dry cleaning L-136
fats and oils F-44–5
illuminating gas contains G-30
petroleum and derivatives P-174, *chart* P-176–7
rubber R 243, *diagram* R-243
Hydrochlo'ric acid, or **muriatic acid**, an acid composed of hydrogen and chlorine H-459
antidote F-96
aqua regia contains G-134
copper refining C-474
electrolytic decomposition E-315
equivalent and molecular weight S 234–5
etching, metal E 387
gastric juice contains D 91*a*, H-459, S-401
gelatin and gluemaking G-35
Le Blanc sodamaking process S 226
Hydrocyan'ic acid, or **prussic acid**, a poisonous compound of hydrogen, carbon and nitrogen C 532–3
causes instant death P 341
plants produce P-338
Hydroelectric power, electricity from generators driven by water power W-68–70, T-212, *pictures* W-67, 69, *tables* W-69 For hydroelectric power in various countries and states *see in Index* country or state by name *subhead* hydroelectric power, *also* Water power
dams D 7, *pictures* D 6–7, 11*a–b* *See also in Index* Dam *table*
government control W 70, E-314
tides possible use T-131
turbines W-68, T-212, *picture* W-69
world W-68–9, *table* W-69 proportion used *chart* F 314
Hydroextractor, a centrifugal machine used in laundries to extract water from cloth L 136
principle of machine C-178
Hydrofluor'ic acid, a compound of hydrogen and fluorine (HF) frosts glass G-122*b*
Hy'drogen, the lightest chemical element H-459–60, *tables* P-151, C-214
acids all contain A-9
ammonia formed from A-236
atom *diagrams* A-457, E-344*e* Bohr orbits E-344*f*, *diagram* E 344*e* electronic structure E 344*e*, *diagrams* C-213, A-458, size C-211
balloons buoyed by B 28*d–9*. Zeppelin B-32, first use B-33–4
discovery C-221
electric cell B-80, *diagram* B-80
electrochemical activity and reactions E-315, A-10
electrolysis produces E-302
flame hottest known H-459; invisible F-74
hydrocarbons H-458–9, *diagrams* H-458–9
illuminating gas contains G-30, 31
ion concentration H-460, A-10
ionization in solution E-301
isotopes H-459, *pictures* R-54*a*, *table* C-215
liquefaction and freezing points H-460
"ortho" and "para" forms H-459–60
protoplasm contains B-145
spectrum explained S-333–4
water formation W-64
Hydrogena'tion, process for increasing hydrogen content of oils H-458–9, *chart* P-175
gasoline P-178
Hydrogen bomb A-467–9
first test in 1952 A-470
production ordered T-200*a*
Hydrogen chloride, a gaseous acidic acid (HCl) in water solutions often called hydrochloric acid C-217–18, H-459 *See also in Index* Hydrochloric acid
Hydrogen peroxide or **dioxide**, a compound (H_2O_2) of hydrogen and oxygen strongly disinfectant used for cleansing and bleaching
guided missiles use G-225*b*
Hydrogen welding W 90
Hydrographic Office, U S a branch of the Bureau of Navigation U S Department of the Navy U-362
iceberg charts I-8
Hydrographic surveying, surveying of oceans lakes and rivers S-458
Hydrologic cycle, or **water cycle** W-61–2, E-181, *diagrams* C-453, W-61
relation to flood control F-143
soil conservation and E-221–2
Hydrolysis, process of decomposition by a chemical interaction with water H-460
glucose G 127
storage batteries B-81–2
Hydrom'eter, a floating instrument for determining the density of liquids H-460
testing storage batteries B-81
Hydrophobia (*hi-dro-fo bi-a*), or **rabies**, disease caused by a virus in the saliva of infected animals and transmitted by bites
Pasteur treatment P 96, D 103
prevention and treatment D-103, H-310 vaccine V-433*b*
Hydrophobia skunk S-195
Hy'drophone, device for listening under water used to detect submerged submarines S-438
Hydrophyllaceae *See in Index* Water-leaf family
Hy'drophytes plants which require great moisture as contrasted with those that require only moderate moisture (mesophytes) and desert plants (xerophytes) W-67
Hy'droplane, a boat B-217, M-436
Hydroplane, a flying boat' or 'seaplane', an airplane which may rise from or descend upon the water *See also in Index* Seaplane
Hydroplane, or diving rudder, on submarine S-435
Hydropon'ics, soilless gardening also called water gardening P 307–9
Hydroquinone (*hi-dro-kwi non'*), an organic compound $C_6H_4(OH)_2$; formula, *diagram* O 424*a*
photographic developer P-221
Hy'drosphere, the water on the earth E-193
Hydrostat'ic paradox, the seemingly impossible arrangement by which a small weight or force can be made to support a very large weight or exert a large force
illustrated by hydraulic press H-458, *picture* H-457
Hydrostatic press *See in Index* Hydraulic press
Hydrostatics, a branch of hydraulics dealing with pressure and other phenomena in liquids at rest *See also in Index* Liquid
Hydrot'ropism
insects I-160
plants P-296
Hydrox'ide, a compound containing one or more elements in combination with hydroxyl (OH)
alcohols A-146
alkalies A-9, A-168
bases E 315
calcium L-244
electronegative charge A-10
lithium A-168
potassium P-389, 390
sodium (caustic soda) S-225. *See also in Index* Caustic soda
Hydroxyl, one atom of hydrogen and one of oxygen united (OH) and forming hydroxides with other elements or compounds A-9, C-217 *See also in Index* Hydroxide
Hydrozoa, a class of coelenterates including the hydra the hydroids or zoophytes' and the Portuguese man-of-war
Hydrus, a southern constellation *chart* S-375
Hyena (*hi-ē'na*) a doglike carrion-eating animal H-460, *picture* H-460
Hygeia (*hi-je'a*) in Greek mythology goddess of health H 300
Hygiene (*hi'jen*) H-300–7, *pictures* H 300–1, 307, *Reference-Outline* P-246 *See also in Index* Medicine and surgery, Physiology Public health, and chief subjects listed below
accident insurance I-168*b*
alcohol effect on health A-145
allergy A-170
antiseptics and disinfectants A-265–8
athletics A 449–50
baby care B-2–4, *picture* B-2, *table* B-3
baths H-306
bibliography P-247
camp sanitation C-62–3
Child Health Day F-56
childhood C-240*b*
clothing H-306
colds avoiding H-305
diet F-211, H-302–4, *chart* F-211' complete requirements H-302, excess fat storage F-216, meals per day H-303; weight control F-216, 217, H-302–3
drug taking dangers D-156, N-13
ear H-305
emotion E-340–340*b* *pictures* E-340–340*b*
exercise P-227–8, H-306, 314
eye E-462, H 305–6
factory inspection H-308, 310
flies F 188–9
food H-302–4 inspection H-308, 310; sanitation H-304
foot F-226
fresh air H-304–5
health department H-308–10, *pictograph* H-309
health insurance I-168*b*
heating H-321–6, H-304–5, *pictures* H-321–5
household sanitation H 304
laxatives and physics, warning against H-302
leisure L-158–61
medical care in U S U-333–4
mental hygiene M-172–3 H-306: U.S Public Health work H 310
physical examination H-302

play activities depend on health I 317
plumbing P 322–3 *pictures* P 323
posture P 228 H 306 *pictures* H 412 P 228
public health or community hygiene H 308–10 H 300–1 *pictograph* H 309
school subject in kindergarten K 44
sewerage S 110
sleep S 198 9 H 308
sun as health giver V 496 498
sweatshop system reform S 460
teeth D 72 T 35 6
ultraviolet radiation I 233 234
ventilation H 321–6 H 304–5 *pictures* H 321–5
vitamins V 494–8 H 302
water supply W 72
weight in youth and age H 302
work and fatigue W 199–200 *chart* H 412 *pictures* H 412

Hygrometer instrument for measuring moisture in air H 461 *picture* H 461

Hyksos (*hik sōs*) dynasty of foreign rulers in Lower Egypt E 279 B 8

Hyla (*hī lą*) the tree frog F 301 *picture* F 299

Hylean Amazon International Institute of A 186

Hymans (*ē mans*) **Paul** (1866–1941) Belgian statesman leader of Liberal party delegate to Peace Conference 1919 and to various international meetings president first assembly of League of Nations ambassador to Great Britain minister foreign affairs

Hymen in Greek mythology god of *marriage*

Hymenoptera an order of insects having four membranous wings and mouth parts fitted for both chewing and sucking includes bees wasps ants sawflies and ichneumon flies I 160*a*

Hymen Terrace Yellowstone National Park *picture* Y 337

Hymettus Mount peak of Attica bounding Athenian plain on se about 3 mi s of Athens 4370 ft marble quarries *famous for honey* in ancient times

Hymn
Addison s A 18
development of hymn writing M 467
early history origin of tunes M 459
Muse of M 454
national N 40 3 *pictures* N 40 42–3
Wesley W 92

Hyndman Henry Mayers (1842–1921) English socialist founded the Social Democratic Federation in Great Britain defended free institutions particularly in Ireland and India

Hyndman Peak a mountain peak in s Custer County in s central Idaho (12 078 ft) *map* I 21

Hyoid bone a small U shaped bone in the base of the tongue attached by ligaments to temporal bone and serves as attachment for muscles used in swallowing S 192

Hyoscine *See* ALKALOID *Index* Scopolamin

Hyoscyamus *See* POISON *Index* Henbane

Hypatia (*hī pā shi ą*) (A D 370–415) Greek mathematician and philosopher famed for her beauty and wisdom head of Neo Platonic school at Alexandria murdered by Christian mob the heroine of Charles Kingsley s novel Hypatia

Hyperbola a plane curve *drawn* that any point on it is distant from two fixed points named foci by a difference which is constant for all points *See also* the *Index* Conic sections

Hyperbolē (*hī pĕr bō lē*) a figure of *speech* F 65

Hyperboreans in Greek mythology a blameless people dwelling in a land beyond the north wind a paradise of perpetual youth connected with worship of Apollo

Hyperion (*hī pēr i ŏn*) in Greek mythology a Titan father of Helios the sun god later sometimes the sun god himself

Hyperion poetic romance by Longfellow L 309

Hypermetamorphosis the type of insect growth in which the larva undergoes more than one transformation before becoming a pupa
blister beetle B 107

Hypermetropia, farsightedness E 462 S 330

Hyphasis River in Punjab *See* the *Index* Beas

Hyphen use of P 438

Hypnoanalysis H 462

Hypnos (*hip nŏs*) in Greek mythology god of sleep corresponding to Roman Somnus

Hypnotics narcotics used to produce profound sleep N 13

Hypnotism H 461 2
mass or group hypnosis H 462

Hypo photographers trade name for sodium thiosulfate ($Na_2S_2O_3$)
action as fixer in developing photographs P 221

Hypocaust S 424

Hypogastric plexus network of nerves in abdomen P 245

Hypogynous (*hī pŏj i nus*) flowers F 184 *picture* F 185

Hypophysis *See* the *Index* Pituitary gland

Hyposulfite of sodium a salt of sodium and hyposulfurous acid (Na_2SO_2) often confused with sodium thiosulfate the photographers hypo S 226

Hypothalamus in brain B 280 I 340*b picture* B 281

Hypothesis in geometry G 62

Hyracoidea (*hī ra koi dē ą*) or **hyraxes** commonly called **coneys** a small order of primitive rabbit like mammals some of whom live in trees others in rocky crevices found in Africa and Near East

Hyrcanus I (*her kā nus*) **John** (died 105? B C) high priest of Jews under his rule Judea gained tremendously in power and independence competing an advantageous alliance with Rome and conquering Syrians and Samaritans was member of Maccabees noted family of Jewish patriots

Hyrcanus II (died 30 B C) high priest of Jews grandson of above ruled at intervals from 69 to 40 B C incompetent ruler finally put to death for treason

Hyslop James Hervey (1854–1920) psychologist and philosopher born Xenia Ohio professor of logic and ethics at Columbia University 1895–190 editor *Journal of American Society for Psychical Research* (Science and a Future Life Life after Death Enigmas of Psychical Research)

Hyson tea kind of green tea *picture* T 29

Hyssop (*his ŭp*) a perennial garden herb (*Hyssopus officinalis*) of the mint family with spikes of small blue *flowers* tea made from leaves formerly used in treatment of various pulmonary diseases The hyssop referred to in the Bible used for sprinkling purposes is a different plant probably a tropical member *of pokeweed family*

Hysteria
psychoanalysis in treatment of P 424*b*–5